This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

WIDENER LIBRARY
HX HKRL 6

Sci 1635.52

VE RI
TAS

HARVARD
COLLEGE
LIBRARY

Sci 1635.52

VE RI TAS

HARVARD
COLLEGE
LIBRARY

Given to the Bussey Institution — by Hon. Wilson C. Flagg. 3 May 1877.

TENTH ANNUAL REPORT

Sci 1635.52

✓

OF THE

STATE BOARD OF AGRICULTURE

OF THE

STATE OF MISSOURI,

FOR THE YEAR 1874.

EDITED BY
JOHN S. MARMADUKE,
CORRESPONDING SECRETARY.

JEFFERSON CITY:
REGAN & CARTER, STATE PRINTERS AND BINDERS.
1875.

TENTH ANNUAL REPORT

OF THE

STATE BOARD OF AGRICULTURE

OF THE

STATE OF MISSOURI,

FOR THE YEAR 1874.

EDITED BY
JOHN S. MARMADUKE,
CORRESPONDING SECRETARY.

JEFFERSON CITY:
REGAN & CARTER, STATE PRINTERS AND BINDERS.
1875.

HARVARD COLLEGE LIBRARY
TRANSFERRED FROM
BUSSEY INSTITUTION
1936

To the General Assembly of the State of Missouri:

In pursuance of section eight of article one, chapter four of Wagner's Statutes of Missouri, entitled "Of Agricultural Societies," I have the honor to transmit herewith the Transactions of the State Board of Agriculture for the year 1874.

Very respectfully,
JOHN S. MARMADUKE,
Corresponding Secretary.

CLASSIFICATION OF CONTENTS PUBLISHED IN THIS REPORT.

I. Laws concerning the State Board of Agriculture and County Agricultural and Mechanical Societies.
II. Members and Officers of the State Board of Agriculture.
III. Proceedings of the State Board of Agriculture at its Annual Meeting in 1874.
IV. Corresponding Secretary's Report.
V. Proceedings of the State Horticultural Society, 1874.
VI. State Entomologist's Report for 1874.

LAWS CONCERNING THE STATE BOARD OF AGRICULTURE AND COUNTY AGRICULTURAL AND MECHANICAL SOCIETIES.

G. S., Ch. 159, § 1—1. A Board of Agriculture is hereby instituted and created a body corporate, by the name and style of the "Missouri State Board of Agriculture," and by that name shall have perpetual succession; power to sue and be sued; complain and defend in all courts; to make and use a common seal, and to alter the same at pleasure.

Ibid, § 2—2. The persons named as corporators of the Missouri State Board of Agriculture heretofore existing, and the duly elected officers thereof, are hereby constituted the officers and members of the Board of Agriculture hereby created until their successors shall be duly elected and qualified.

Ibid, § 3—3. The Missouri State Board of Agriculture shall, at their next annual meeting, in addition to filling the vacancies then occurring, elect two additional members, and the Governor of the State and the Superintendent of Public Schools shall be *ex officio* members of the Board. Immediately after the State Board of Agriculture has been increased to twelve elected members, as herein provided, said twelve members shall, by themselves and by lot, be divided into three classes of four each, numbered one, two and three. The term of service of class number one shall expire at the annual meeting in 1867; of class number two at the annual meeting in 1868, and of class number three in 1869; and at the annual meeting in 1867, and at each annual meeting thereafter, there shall be elected four members for the term of three years, to fill the vacancies occurring by expiration of term of service, and any vacancies occurring in unexpired terms of service shall be filled by election for the unexpired term. In case of failure by the President or delegates of County Agricultural Societies to fill vacancies at the annual meeting, the Board shall have power to fill the same by election.

Ibid, § 4—4. The officers of said Board shall be a President, Secretary and Treasurer, and such other officers as said Board shall deem necessary, who shall be elected at the annual meeting thereof, and shall serve for one year, and until their successors are duly elected and prepared to enter upon the duties of their respective offices.

Ibid, § 5—5. The Missouri State Board of Agriculture, and their successors, shall have the power to adopt such by-laws and make such rules and regulations for the government of said Board and the management of its affairs and business as they may deem best calculated to promote the interest of agriculture, and as shall not be inconsistent with the Constitution and laws of the State of Missouri and of the United States.

IBID, § 6—6. There shall be held in the city of St. Louis, on the first Wednesday of December of each year, an annual meeting of the Board of Agriculture, together with the President of each County Agricultural Society, or other delegates therefrom, duly authorized, who shall, for the time being, be *ex officio* members of the State Board of Agriculture, for the purpose of deliberation and consultation as to the wants, prospects and condition of the Agricultural interests of the State; to receive the reports of the District and County Societies, and to fill by elections all vacancies in the State Board of Agriculture. The President also shall have power to call meetings of the Board whenever he may deem it expedient, and at any meeting of said Board seven members thereof shall constitute a quorum for the transaction of business.

IBID, § 7—7. It shall be the duty of all Agricultural and Horticultural Societies, organized and established in accordance with the laws of this State, to make a full report of their transactions to the Missouri State Board of Agriculture at each annual meeting thereof.

IBID, § 8—8. It shall be the duty of the said Board to make an annual report to the General Assembly of the State, embracing the proceedings of the Board for the past year, and an abstract of the reports and proceedings of the several agricultural and horticultural societies, as well as a general view of the condition of agriculture and horticulture throughout the State, accompanied by such recommendations, including especially such a system of public instruction upon those subjects as may be deemed interesting and useful.

IBID, § 9—9. The sum of one hundred dollars is hereby appropriated out of any moneys not otherwise appropriated for the uses of the Board, and an account of the expenditures of the Board shall be included in the annual report to the General Assembly.

IBID, § 10—10. The Public Printer shall, annually, under the direction of the President of the State Board of Agriculture and the President of the State Horticultural Society, print and bind, in one volume, six thousand copies of the Annual Report of the said Board of Agriculture and the proceedings of the State Horticultural Society; thirty-eight hundred copies to be for the use of the General Assembly, two hundred for the State Library, one thousand copies for the State Board of Agriculture, and one thousand copies for the State Horticultural Society, for distribution to the agricultural, horticultural and mechanical associations throughout the State.

AGRICULTURE: STATE BOARD OF—PUBLICATION OF REPORT.

AN ACT to amend section ten (10) of chapter fifty-nine of the General Statutes of Missouri, the same being section ten (10) of article one (1) of chapter four (4) of Wagner's Missouri Statutes, third edition, concerning "State Board of Agriculture."

Be it enacted by the General Assembly of the State of Missouri, as follows:

SECTION 1. Section ten of chapter fifty-nine of the General Statutes of Missouri is hereby amended so as to read as follows: Section 10. The Public Printer shall, annually, under the direction of the President of the State Board of Agriculture, print fourteen thousand copies, of which two thousand shall be in the German language, of the Annual Report of the said Board of Agriculture; five hundred copies to be bound in cloth, balance in paper covers, to be distributed as follows: Twenty copies to each member of the General Assembly; fifty bound copies to the State Library; thirty copies to each county clerk for distribution among the farmers, as generally as may be, and the remainder to the State Board of Agriculture, to be distributed among the several Agricultural and Horticultural Societies and farmer clubs of this State and other States, as the Board may direct: *Provided*, That said Annual Report shall not contain more than five hundred pages.

SEC. 2. All acts and parts of acts inconsistent with this act are hereby repealed.

SEC. 3. This act to take effect and be in force from and after its passage.

Approved March 24, 1875.

APPROPRIATIONS: BOARD OF AGRICULTURE.

Be it enacted by the General Assembly of the State of Missouri, as follows:

SECTION 1. There is hereby appropriated out of any money in the State Treasury, not otherwise appropriated, the sum of four thousand dollars, annually, for the benefit of the State Board of Agriculture, and the sum of one thousand dollars ($1,000) is hereby appropriated for the State Horticultural Society, to be paid to the Treasurer thereof quarterly.

SEC. 2. The sum mentioned in the first section of this act shall be paid to the President of the State Board of Agriculture, in quarterly installments, upon the warrant of the State Auditor, drawn in favor of the President of said Board upon the State Treasurer for such quarterly installments: *Provided*, That after the payment of the first quarterly installment the State Auditor shall not draw his warrant upon the State Treasurer for the succeeding quarterly installments respectively, until the President of the State Board of Agriculture shall have filed in the office of the State Auditor good and sufficient vouchers, showing the proper expenditures of the preceding installment, in accordance with the objects of said Board.

SEC. 3. This act to take effect and be in force from and after its passage.

Approved March 18, 1871.

COUNTY AGRICULTURAL AND MECHANICAL SOCIETIES.

ACTS 1867, p. 3—1. Whenever fifty freeholders within this State shall present a petition to the county court of the county in which they or a majority of them reside, setting forth that they desire to organize and be incorporated for the purpose of promoting improvements in agricultual manufactures and the raising of stock, and the court shall be satisfied that such persons are freeholders of this State, the court shall, by an order, declare the petitioners incorporated for the purposes specified in this section; and thenceforth the petitioners shall be a body politic and corporate by the name and style of the (naming it) County Agricultural and Mechanical Society, and by that name they and their successors shall be known in law; have perpetual succession; sue and be sued; plead and be impleaded; defend and be defended, in all courts and in all actions, pleas and matters whatsoever; and shall have power to purchase, hold and receive any quantity of land not exceeding one hundred acres, with such buildings and improvements as may be placed thereon, and any other property not exceeding in value fifty thousand dollars; and may, by vote, determine that thereafter the members of said Society shall be composed of such persons as shall subscribe at least one share to the capital stock thereof, in shares not exceeding twenty-five dollars each; said shares to be personal property and transferable by agreement; but no transfer shall be binding on the Society until reported to and approved by the Board of Directors. The amount of such capital stock shall, from time to time, be fixed by the stockholders or Board of Directors, provided the same shall at no time exceed one hundred thousand dollars; and may convey, lease, sell and dispose of the property of the Society, or any part thereof, for the benefit of the Society, and may have a common seal, and break and alter the same at pleasure.

G. S., Ch. 60, § 2—2. Within thirty days from the date of the order of the county court, any number of the petitioners, exceeding twenty, may proceed to organize such Society by electing nine Directors, who shall hold their offices one year, and until their successors are elected; and the Directors, when so elected, shall collectively form a Board for the government of such Society, and in such Board shall be vested all the corporate powers and duties of every Society incorporated as provided in this chapter; and for the purpose of electing the Directors, there shall be held annually a general meeting of the members of the Society. All vacancies in the Board of Directors shall be filled by appointment of the Board. No person not a member of the Society shall be a Director.

Ibid, § 3—3. Every Board of Directors shall assemble within twenty days after their election; and choose a President of their number, and some other persons as Secretary, Treasurer, Collector, and such other officers, servants and agents as may be necessary, remove them from office and prescribe their duties; and all proceedings of the Board shall be public.

Ibid, § 4—4. It shall be the duty of the President to preside at all meetings of the Board and of the Society, and in case of his absence, such other person as the members present shall appoint; and it shall be the duty of the Secretary to keep a record of the proceedings of the directors and of the Society; and the Treasurer shall give bond and security, to the acceptance of the Board of Directors, for the benefit of the Society, in such sum as they, or a majority shall determine, conditioned that he will faithfully receive and pay over, on their order, all moneys or other articles, the property of the Society, that may come into his hands as Treasurer, which bond shall be deposited with the Secretary of the Board of Directors; and the said Treasurer shall keep fair and accurate entries of all moneys and other articles by him received as Treasurer, and from whom received, and to whom and for what purpose paid out, and make report of the financial operations of his office as often as he may be directed by the Board of Directors.

Ibid, § 5—5. The said Board, a majority of whom shall form a quorum, shall have power to make, ordain and adopt a constitution and all necessary by-laws, ordinances, rules and regulations for the government of the Board of Directors and of the Society, and for the promotion of the objects for which it is designed; and the President of the Board shall cause the same to be carried into effect; provided such constitution, by-laws, ordinances, rules and regulations, shall not be inconsistent with the Constitution and laws of this State.

Ibid, § 6—6. All moneys paid by members and others, and donations made to the Society, shall be appropriated under the direction of said Board, in conformity to such constitution, by-laws, rules and regulations as may be ordained and established for the government of the Society and for the advancement and encouragement of the objects of the Society.

IBID, § 7—7. The county court of any county, in which there shall be a Society organized according to this chapter, or any special act of incorporation, shall have the power, and may, if it shall be deemed expedient, appropriate out of the county treasury for the benefit of the Society, the sum of one hundred and fifty dollars in any one year; and the money so appropriated shall be drawn by the Treasurer of the Society in a proper warrant: *Provided*, Said money shall be annually awarded by the Board of Directors in premiums, or expended by them in the purchase of premiums, to be known as "The (name the county) County Court Premiums," to be awarded according to the rules, regulations and by-laws of the Society: *And provided further*, That not more than one such premium shall be awarded to the same animal or article on exhibition by the same county Society.

IBID, § 8—8. At each annual meeting of the Society, the Board of Directors shall report, in writing, the number of members and the financial condition of the Society; the quantity and character of the property owned by it, and the quality and cost of improvement of the same; the number and value of premiums awarded at their annual fair; the number and character of animals and articles exhibited; a statement of the probable quantity of the staple commodities of the county, and prices current thereof, and such other information in relation to the agricultural and mechanical interests of the county as they may deem worthy of general notice; and a copy of the report so made shall be transmitted to the Board of Directors of the Missouri State Agricultural Society (Missouri State Board of Agriculture), to be disposed of as provided in the next succeeding section of this chapter.

IBID, § 9—9. The Board of Directors of the Missouri State Agricultural Society, (Missouri State Board of Agriculture), report faithfully all the facts, statistics and information contained in the reports transmitted to them from the county agricultural and mechanical societies organized and incorporated under the provisions of this chapter, and such other facts, statistics and information as they may gather from other counties in this State in regard to agricultural, mechanical and domestic manufactures and productions, and to the raising of the various breeds of stock.

IBID, § 10—10. The land and other property which may be held by any Society under the provisions of this chapter, shall be held by the Society for the sole purpose, and none other whatsoever, of erecting inclosures, buildings and other improvements, calculated and designed for meetings of the Society, and for exhibitions of various breeds of horses, cattle, mules and other stock, and of agricultural, mechanical and domestic manufactures and productions, and for the purchase and importation and the keeping thereof of such foreign breeds of stock as the Board of Directors may deem advantageous to the interests of the county.

IBID, § 11—11. The members of any Society, organized under the provisions of this chapter, shall be composed of such persons, and none others, as shall have subscribed their names as such in the books in which the proceedings of the Society and of the Board of Directors are or shall be recorded, and paid annually to the Treasurer of the Society such sum, not exceeding five dollars in any one year, as may be established by the rules, by-laws and regulations of the Society as a membership fee; and such persons shall be members only for the year for which he shall [have] paid such fee.

IBID, § 12—12. A duly authenticated copy of the order of the county court, provided for in section one of this chapter, shall be filed and recorded in such manner as conveyances of land are by law directed to be recorded in the office of the recorder of the county, within three months after such order shall be made.

IBID, § 13—13. The constitution, by-laws, rules and regulations of the Society and Board of Directors, shall be printed and circulated among the members of the Society within thirty days after their adoption.

IBID, § 14—14. Whenever a majority of two-thirds of the members of any Society, organized under the provisions of this chapter, shall, at an annual meeting, declare such Society dissolved; or if, from any other cause, said Society shall be dissolved or fail to meet and pursue the objects of the Society for the period of five consecutive years, then the real estate and all other property held by it shall be sold for cash in hand, at public auction, before the courthouse door of the county, after thirty days' notice given in some newspaper published in the county, if there be one, and if not, by ten printed advertisements set up in ten public places in the county, describing the property to be sold, and the time, place and terms of sale. Such sale shall be conducted by the Directors, or a majority of them, chosen and elected as provided by this chapter.

IBID, § 15—15. At any fair, show or exhibition, held by any incorporation, Agricultural and Mechanical Society, every person who shall, without the permission of the officers of such Society, enter within any inclosure which may be used by such Society as an agricultural and mechanical fair, and every person guilty of disorderly conduct, or such conduct as may interrupt or be prejudicial to the interests of such fair or exhibition whatever, within the inclosure for the same, or at a distance within two hundred yards of such inclosure, shall be liable to immediate arrest by any officer of such Society, and to the payment of five dollars to the Society holding such fair, show or exhibition, to be reconcilable at the suit of such Society before any justice of the peace of the county in which such fair, show or exhibition may be held.

IBID, § 16—16. All agricultural societies in this State, established under the act above recited, and that have failed, to keep up their organization, as required by the law approved November 23, 1855, are hereby authorized and empowered to pursue the objects of such societies and perpetuate their organizations as though no failure to observe the law had occurred.

MEMBERS OF THE BOARD FOR 1874.

Gov. SILAS WOODSON	Ex officio members.
JOHN MONTEITH, State Superintendent Public Schools	
NORMAN J. COLMAN, President	St. Louis county.
JOHN W. HARRIS, Vice-President	Boone county.
M. V. L. McCLELLAND	Lafayette county.
HENRY T. MUDD	St. Louis county.
G. W. KINNEY	St. Charles county.
GEORGE HUSMANN	Pettis county.
WILLIAM STARK	Pike county.
J. J. SQUIERS	Jefferson county.
LUMAN A. BROWN	Howard county.
E. W. BISHOP	Phelps county.
JOSIAH TILDEN	Jasper county.
D. A. ELI	Adair county.

C. V. RILEY, STATE ENTOMOLOGIST	St. Louis county.
WILLIAM T. ESSEX, TREASURER	St. Louis county.
JOHN H. TICE, RECORDING SECRETARY	St. Louis county.
JOHN S. MARMADUKE, CORRESPONDING SEC'Y.	St. Louis county.

MEMBERS OF THE BOARD FOR 1875.

	POST OFFICE.	
CHAS. H. HARDIN, Gov. of Missouri (ex officio member)	Jefferson City	Cole county.
RICH. D. SHANNON, State Superintendent Public Schools (ex officio member)	Jefferson City	Cole county.
LUMAN A. BROWN, President	Boonsboro	Howard county.
HENRY T. MUDD, Vice-President	Kirkwood	St. Louis county.
NORMAN J. COLMAN	St. Louis	St. Louis county.
JOHN W. HARRIS	Rocheport	Boone county.
M. V. L. McCLELLAND	Wellington	Lafayette county.
G. W. KINNEY	Snow Hill	St. Charles county.
GEORGE HUSMANN	Sedalia	Pettis county.
JOSIAH TILDEN	Carthage	Jasper county.
D. A. ELI	Kirksville	Adair county.
J. L. McCULLOUGH	Gentryville	Gentry county.
JOHN MONTEITH	Iron Mountain	Iron county.
D. L. HALL	Kansas City	Jackson county.

C. V. RILEY, STATE ENTOMOLOGIST	St. Louis.
W. T. ESSEX, TREASURER	St. Louis.
JOHN S. MARMADUKE, CORRESPONDING SECRETARY	St. Louis.

PROFESSOR JOHN H. TICES' REPORT

(AS RECORDING SECRETARY.)

OF THE

PROCEEDINGS

OF THE

STATE BOARD OF AGRICULTURE,

AT ITS ANNUAL MEETING IN DECEMBER, 1874.

FIRST DAY.

Office Missouri State Board of Agriculture,
December 2, 1874.

Pursuant to the provisions of the act of incorporation, designating the first Wednesday of December as the time for holding the Annual Meeting of the Missouri State Board of Agriculture, the Board met.

Present: Norman J. Colman, President; John W. Harris, Vice President; M. V. L. McClelland, Henry T. Mudd, George W. Kinney, George Husmann, William Stark, John J. Squire, Luman A. Brown, E. W. Bishop, Josiah Tilden and D. A. Eli, of the incorporated members, and Governor Silas Woodson of the *ex officio* member.

Absent: John Monteith, State Superintendent of Public Schools, *ex officio* member.

On motion, a committee of three members, consisting of L. A. Brown, George W. Kinney and E. W. Bishop, was appointed to examine and report upon the credentials of delegates to the annual meeting.

Mr. J. H. Tice, Recording Secretary, made the following report in behalf of the Auditing Committee:

St. Louis, December, 2, 1874.

To the Hon. N. J. Colman, *President Missouri State Board of Agriculture:*

Sir: I beg leave to submit to the Board the following as a correct list of the accounts audited and warrants issued upon the Treasurer for the payment of them during the fiscal year ending on the 1st inst., namely:

Date.	To whom and on what account.	Number.	Amount.	Total.
1873.				
December 4...	John F. Wielandy, salary	157	$150 00	
4...	Gov. S. Woodson, expenses	158	6 00	
4...	John H. Tice, salary	159	8 33	
4...	Same, expenses	160	4 50	
4...	Wm. Stark, expenses	161	24 50	
4...	Luman A. Brown, expenses	162	15 00	
4...	Geo. W. Kinney, expenses	163	10 50	

RECORDING SECRETARY'S REPORT—Continued.

Date.		To whom and on what account.	Number.	Amount.	Total.
1874.					
	4...	John J. Squiers, expenses	164	7 00	
	4...	E. W. Bishop, expenses	165	15 50	
	6...	J. W. Harris, expenses	166	24 90	
	6...	M. V. L. McClelland, expenses	167	14 50	
	6...	Insurance Exchange, rent and gas	168	50 16	
	31...	John H. Tice, salary	169	8 33	
	31...	J. F. Wielandy, salary	170	150 00	
	31...	C. V. Riley, salary	171	250 00	
					$739 22
1874.					
January	9...	Geo. W. Kinney, salary to com. business	172	$10 50	
	14...	Insurance Exchange, rent and gas	173	47 50	
	31...	C. V. Riley, salary	174	250 00	
					308 00
February	1...	J. F. Wielandy, salary	175	$150 00	
	1...	J. H. Tice, salary	176	8 35	
	28...	Insurance Exchange, rent	177	41 66	
	28...	C. V. Riley, salary	178	250 00	
	28...	J. S. Marmaduke, salary	179	116 67	
	28...	J. H. Tice, salary	180	8 35	
					575 08
March	19...	Expenses in running offices, to Mut'l B.	181	$170 25	
	22...	J. F. Wielandy, expenses	182	150 65	
	31...	C. V. Riley, salary	183	250 00	
	31...	St. Louis Mutual, rent	184	41 66	
	31...	John S. Marmaduke, salary	185	114 66	
	31...	John H. Tice, salary	186	8 34	
	31...	J. S. Marmaduke, lounge for office	187	43 30	
					778 86
April	30...	C. V. Riley, salary	188	250 00	
	30...	St. Louis Mutual, rent	189	41 66	
	30...	J. S. Marmaduke, salary	190	114 66	
					406 32
May	4...	C. V. Riley, expenses	191	$7 40	
	31...	C. V. Riley, salary	192	250 00	
	31...	J. S. Marmaduke, salary	193	114 66	
	31...	St. Louis Mutual, rent	194	41 66	
					413 72
June	5...	J. S. Marmaduke, expenses	195	$92 25	
	30...	C. V. Riley, salary	196	250 00	
	30...	J. S. Marmaduke, salary and corrections	197	122 66	
	30...	John H. Tice, ¼ salary	198	25 00	
	30...	St. Louis Mutual, rent	199	41 66	
					531 57
July	31...	C. V. Riley, salary	200	$250 00	
	31...	J. S. Marmaduke, salary	201	116 66	
	31...	St. Louis Mutual, rent	202	41 66	
	31...	J. H. Tice, salary	203	8 34	
					416 66

RECORDING SECRETARY'S REPORT—Continued.

Date.	To whom and on what account.	Number.	Amount.	Total.
1874.				
August 25...	J. S. Marmaduke, expenses..................	204	$73 80	
31...	J. S. Marmaduke, salary........................	205	116 66	
31...	C. V. Riley, salary..................................	206	250 00	
31...	St. Louis Mutual, rent............................	207	41 66	
31...	John H. Tice, salary................................	208	8 35	
				490 47
October 1...	John H. Tice, salary...............................	209	$8 33	
1...	C. V. Riley, salary..................................	210	250 00	
1...	J. S. Marmaduke......................................	211	116 66	
1...	St. Louis Mutual, rent............................	212	41 66	
				416 65
November 1...	C. V. Riley, salary..................................	213	$250 00	
1...	J. S. Marmaduke, salary........................	214	116 66	
1...	St. Louis Mutual, rent............................	215	41 66	
1...	J. H. Tice, salary.....................................	216	8 34	
11...	J. S. Marmaduke, expenses..................	217	228 80	
				645 46
December 1...	C. V. Riley, salary..................................	218	$250 00	
1...	J. S. Marmaduke, salary........................	219	116 66	
1...	St. Louis Mutual, rent............................	220	41 66	
1...	J. H. Tice, salary.....................................	221	8 33	
				416 65
	Total..	....	....	$6,138 61

All of which is most respectfully submitted in behalf of Executive and Auditing Committee.

JOHN H. TICE,

Recording Secretary and ex officio member of Committee.

Mr. W. T. Essex, Treasurer, made the following report of the Receipts and Disbursements for the fiscal year of 1874:

1873.	RECEIPTS.		
December 1...	To amount on hand..	$494 16	
10...	To warrant from State Auditor........................	1,000 00	
1874.			
January 17...	To warrant from State Auditor........................	1,000 00	
April 5...	To warrant appropriation for Entomologist...	3,000 00	
June 17...	To warrant from State Auditor........................	1,000 00	
October 1...	To warrant from State Auditor........................	1,000 00	
	Total..	....	$7,494 16
1874.	EXPENDITURES.		
December 1...	By amount of outstanding warrants of last year..	$397 30	
1...	By amount of warrants issued as above during fiscal year...	6,138 61	
1...	Cash on hand..	958 25	
	Total..	....	7,494 16

On motion the report of the Auditing Committee and that of the Treasurer were referred to a committee of three members, consisting of Messrs. Harris, McClelland and Husmann, for examination and report.

Mr. Brown, from the Committee on Credentials, made the following report:

MR. PRESIDENT: Your Committee on Credentials report that they have performed their duty, and the credentials of the following delegates are correct and entitled to seats at the Board:

D. L. Hall, from the Industrial Exposition and Agricultural Fair Association, Kansas City.

M. H. Fyke, of the Henry Joint Stock Agricultural and Mechanical Association.

T. A. Charles, Jefferson County Agricultural and Mechanical Association.

W. A. Blakey, of the Pleasant Hill Agricultural Association, and

Charles H. Sharp, of the Pike County Agricultural and Mechanical Association.

On motion, a Committee on Business was appointed, consisting of George W. Kinney, M. V. L. McClelland, and Gov. Silas Woodson.

Corresponding Secretary Marmaduke submitted a statement of the condition of the last Annual Report of Judge Wielandy, accompanied with a copy of same as far as printed. At the conclusion of his statement there was a general debate upon the topics touched in the statement, and the fragmentary Report severely criticised by several members. The following gentlemen took part in the discussion, namely : Messrs. Mudd, Woodson, Brown, McClelland, Kinney, Riley, Squiers, Tilden and Colman, and rejoinders by Messrs. Woodson, Mudd and Squiers.

On motion, the meeting then adjourned to 3 o'clock p. m.

AFTERNOON SESSION.

The Board met pursuant to adjournment.

Present: as in the forenoon, together with Hon. John Monteith, Superintendent of Public Schools. Hon. C. H. Hardin, Governor elect, being present, upon being called on, addressed the meeting briefly.

Mr. Squiers presented the following resolution, which was adopted:

Resolved, That in order to more fully understand the requirements of the agricultural interests of the State, that the State Board, through its President, do invite the several corporate members and delegates now attending the present Annual Meeting, to give as full an account as possible of the condition of the Agricultural interest of their several localities.

Grand Master T. R. Allen, of the Missouri State Grange, being present, upon invitation, addressed the meeting upon topics relating to agriculture, and especially upon the object contemplated in the organization of the Board, and upon what it has done and what it has left undone.

Mr. Isidor Bush, of the State Immigration Board, upon invitation, also addressed the meeting.

Dr. Henderson, a St. Louis county granger, by request, made some remarks, full of wit and humor, in which the Board's delinquencies were set off against the delinquencies of the late Corresponding Secretary, Mr. Wielandy, of whom the members were complaining so much.

Mr. Kinney, from the Committee on Business, reported the following resolutions, which were taken up separately and adopted:

Resolved, That the course of the late Corresponding Secretary in refusing to issue his Report for 1873 in proper time, demands immediate investigation, and that this Board take such action as shall set the matter right before the public.

Resolved, That a committee of three be appointed, to act in conjunction with the Corresponding Secretary, to examine and pass upon the forthcoming Report for 1874, and to exclude any matter in their judgment improper to be published.

Resolved, That a committee of three be appointed to select subjects for discussion at the next annual meeting of the Board, and to assign to each corporate member of the Board a subject for an essay, to be written and read at said meeting; such essay to contain matter for not less than five nor more than twenty printed octavo pages, and that this committee be authorized to offer suitable premiums to the public for the best essays on subjects of scientific and practical interest to the producers of the State.

Resolved, That the Corresponding Secretary be required to make a full report of such essays read before the Board, and of all discussions entertained by the same, provided they be considered worthy of publication.

Resolved, That this Board respectfully requests the Legislature of the State to change the time fixed for the annual meeting of this Board to the second Wednesday of February.

Resolved, That the salary of the Corresponding Secretary be fixed at eighteen hundred dollars ($1,800) per annum, to take effect from the first of February 1874.

G. W. KINNEY,
M. V. L. M'CLELLAND, } Committee.
Gov. SILAS WOODSON,

Prof. C. V. Riley, State Entomologist, stated that his Report was advancing towards completion, and would be ready for the press at any time after the 1st of January. He read some extracts from it, which presented new discoveries.

Mr. Squiers submitted a resolution, which after amendment, was adopted in the following form unanimously:

Resolved, That we recognize in our State Entomologist, Prof. Riley, an officer who has at all times faithfully and efficiently discharged the duties of his office, whose labor is of untold value to the State, and whose Reports reflect the highest honor and credit upon the Board and upon the State.

Mr. Brown tendered his resignation, to take effect from and after the adjournment of the present annual meeting.

Messrs. Harris, Mudd and others, expressed regret and surprise at the contemplated retirement of Mr. Brown.

Mr. Mudd submitted the following resolution, which was unanimously adopted:

Resolved, That we sincerely regret that the Hon. Luman A. Brown feels a desire to withdraw from this Board; and, while desiring to gratify his wishes, yet we are convinced that neither the Board nor the State can spare his valuable services; therefore,

Resolved further, That this meeting do not accept the tendered resignation of Mr. Brown, now before it for consideration.

Mr. Brown offered the following resolution:

Resolved, That when this meeting adjourn it adjourn to meet again at 7 o'clock p.m.

Mr. Mudd then read the following communication from C. W. Murtfeldt:

THE TIDE OF IMMIGRATION! WHY IT HAS CEASED TO FLOW TO THE UNITED STATES AND TO MISSOURI?

From the year A. D. 1830, until about 1872, there has been a constantly increasing emigration from Europe to the United States of America, varying indeed during certain periods of that time—as Europe or America was affected by war, cholera or other causes and circumstances—but upon the whole steadily increasing. Certain portions of Europe are overcrowded with people, and it is a marvel how some of these manage to exist at all, for it is a well known fact that in the large cities and in whole countries, like Ireland for instance, thousands are in chronic want of the actual necessaries of life. And yet the proverb holds true with regard to the great majority of the population of Europe, especially the northern section, viz.: "A poor man for children," etc. Hence the draft made by emigration to the United States was hardly felt on the other side of the Atlantic, except as it included too large a number of able-bodied men subject to military duty.

THE EFFECTS OF THE FRANCO-PRUSSIAN WAR.

The *Franco-Prussian* war has caused a great change. Emigration from Europe has almost ceased, and a great many people, including, I should judge, some editors, wonder why it is? The problem is not very difficult of solution. Men emigrate to better their temporal condition, or to enjoy greater personal or political liberties than are allowed under monarchical governments. In Europe (as a rule) it is very difficult for a poor man to ever own in fee simple an acre of ground or a cottage and lot, and although in theory *caste* is condemned, in fact it nevertheless exists, almost so strongly as in India; a very few men indeed rise above the condition in which they were born. In the United States, *per contra*, men from the humblest walks of life *can* rise to the highest social or official positions (and we devoutly pray that this may always be so, and that the *spirit of caste* may never be developed, yea, rather let it be checked), and every one so inclined can achieve the possession of a "home." These inducements, *held out to all*, including the mechanic, but especially the farmer and the farm laborers, have disposed many to bid farewell to their native land and to seek a home and a hearth of their own in the United States.

WAGES THEN AND NOW.

Prior to the *Franco-Prussian* war, skillful artizans and farmers were better paid in this country than in Europe, and many a one has, with his own right arm, hewn out a home, if not a fortune; but at present there is a very different state of affairs, and for these reasons: The war between France and Prussia has cost the lives of many men in the prime of life. Larger and increased levies have been made to fill their places in the armies, and this in turn has reduced the ranks of farmers, mechanics and laborers. As a natural sequence, there is now plenty of work and at remunerative prices, so that the wages of the common farm laborer is double of what it was prior to the war. And this condition of things is true even in a greater ratio with regard to skilled artisans and mechanics. Over and above all we must remember, that the purchasing power of a dollar is double, and in some instances treble in Europe to what it is in the United States.

MONEY IS VERY PLENTY.

Secondly, the tens of millions of indemnity money paid by France to Prussia has made capital abundant and money generally plenty. This seeks investment, hence the rapid increase of manufactures of all kinds, and also the unprecedented growth of the larger cities of the German Empire; the industry displayed in the mines, the extended and extensive building of railroads, etc.; all this is due, in a greater or less degree, to the abundance of money, and in consequence we have the anomalous condition of actual emigration from the United States to Europe. It is worthy of notice also in this connection, that for the want of *paying* patronage, several of the new line of ocean steamers (established to meet the demands of emigration) have laid up (or are about to do so) their vessels, and some of these would no doubt be glad to find buyers for their now almost useless craft.

LOCAL CAUSES.

Is it any wonder that Missouri is lamenting the almost total absence of foreign immigration? Other causes can also be named for the lack of immigration to this State. For instance: After our State Board of Immigration, by unprecedented self-denial, (wonderfully in contrast with the rapacious, grasping propensities of many officials of the present day) in working for nought and boarding themselves, have accumulated a saving of about four thousand dollars, which they propose to devote to the publication of a work in which are set forth some of the natural advantages and wonderful mineral and agricultural resources of this great commonwealth, the State refuses to aid. The completion of this work in anything like a creditable style will cost about ten thousand dollars; but the Board of Immigration asked the State (which is really the only party to be benefitted) for only five thousand dollars, yet this small sum, (comparatively small in view of the results which would certainly follow,) yet even this has been withheld. May we not indulge the hope that our next General Assembly will take a different and a broader view? Let a more liberal spirit dictate its action when this subject shall be again presented. Other causes might be instanced, but no doubt they will occur to the mind of every reflective man who will give to this matter a little close attention.

NO MICAWBER'S FOR MISSOURI.

Although "the race is not always to the swift nor the battle to the strong," there is a great deal in persistent and persevering effort. If we, Micawber like, sit down and fold our hands, waiting for "something to turn up," we are likely to meet only with Micawber's luck. If, on the other hand, Missouri, and especially those in authority, embrace every legitimate opportunity, at home and abroad, to publish to the world something about her undeveloped wealth in nearly all kinds of minerals, her agricultural and commercial advantages; and among other things the fact that the metropolis of the great Mississippi Valley, even St. Louis, is at this day the third largest manufacturing city in the United States, and other facts in regard to her productive powers, and the facilities for lucrative investments of capital, Missouri will certainly obtain her full share of both domestic and foreign immigration.

In the hope that the subject presented will be deemed of sufficient importance to merit the attention of the State Board of Agriculture at this session, I have the honor to subscribe,

Very respectfully,

CHAS. W. MURTFELDT.

On motion, the Board then adjourned to 7 o'clock P. M.

NIGHT SESSION.

Present as in afternoon.

Mr. Squiers suggested that a committee be appointed to suggest some measures for promoting the usefulness and efficiency of the Board.

After some discussion, it was deemed not advisable during the present session, as much special business required the attention of the Board's time. The following resolution was then adopted:

Resolved, That this Board, before final adjournment, appoint a Committee on Business, who shall prepare and submit business for consideration at the next annual meeting, and that said Committee be instructed to devise some plan for increasing the usefulness and efficiency of the Board in promoting and advancing the interest of agriculture.

Resolved further, That Mr. Squiers be requested to submit to-morrow, at his convenience, any resolution or proposition promotive of that end.

The subject of immigration was discussed, but no general plan was suggested to promote it.

The Board then adjourned to meet at 10 o'clock to-morrow morning.

SECOND DAY.

THURSDAY MORNING, December 3, 1874.

The Board met pursuant to adjournment. Present as on yesterday.

Mr. Harris, from the Committee on Treasurer's Report, reported that they had examined the same and compared it with the vouchers, and found the same correct.

Mr. Squiers submitted a resolution regarding the Board offering premiums at the several district fairs, which was discussed at length by Messrs. Woodson, Hall, Brown, Bishop, Husmann, Colman, Harris, Squiers and Tilden. The plan was generally approved, but its impracticability was so apparent as to preclude its adoption.

Mr. Bishop offered a substitute that the Board offer premiums so as to secure valuable essays from competent writers, which are to be published in the transactions of the Board.

Mr. Squiers then withdrew the resolution in favor of Mr. Monteith's substitute and preamble to Mr. Squier's second resolution, to the effect that this Board encourage the organization of Farmers' Conventions in the several Congressional districts;

Which, upon being amended by a preamble and substitute resolution offered by Mr. Monteith, were adopted as follows:

Whereas, It is evident that to make this State Board of Agriculture answer the purpose for which it was originally organized, it is necessary that its operations be brought more directly before the Agriculturists of the State; therefore, as a means of partially accomplishing this end; be it

Resolved, That the premiums for best displays of agricultural products, or for other objects of like nature, be offered by this Board to at least one County or District Agricultural Society in each Congressional District in the State outside of the St. Louis districts, to be competed for at their annual fairs for 1875, under the direction of this Board; and that a committee be appointed to perfect a plan by which the objects may be put into practical shape.

Resolved, That this Board encourage the organization of annual conventions within the boundaries of the several Congressional districts—these conventions to be conducted by members of this Board in each district in conjunction with the officers of this Board.

Mr. Squiers submitted the following resolution, which was adopted:

Resolved, That the Corresponding Secretary be authorized to employ a short-hand reporter to take down and write out the discussions at the next annual meeting, and at each annual meeting thereafter.

Mr. Kinney submitted the following resolution, which was adopted:

Resolved, That the Board now go into Committee of the Whole to investigate the matter of the late Corresponding Secretary in relation to the Annual Report.

The meeting then went into Committee of the Whole, Mr. Brown in the chair.

After spending sometime in Committee of the Whole, the Committee rose, when Mr. Brown reported as follows:

Mr. President: The Committee of the Whole have instructed me to report as follows upon the subject had under consideration:

Resolved, That a committee of three be appointed to examine into the merits and present state of publication of the Report of ex-Secretary Wielandy for 1878; and that said committee be empowered to decide upon the issue and distribution of the whole or of any part of said Report, and to arrest all further expenses pertaining thereto.

Resolved, That said committee be also authorized to make an equitable settlement with the Public Printer in relation to said Report.

On motion, the Report of the Chairman of the Committee of the Whole was adopted, and Gov. Woodson, John Montieth and George W. Kinney, were appointed said committeee.

On motion, the meeting then adjourned to 2½ o'clock P. M.

AFTERNOON SESSION.

Present as in the forenoon.

Mr. Kinney presented the following resolution, which was adopted:

Resolved, That the Entomologist be authorized to use that part of the entomological collection belonging to the Board, and comprising the orders Hymenoptera, Diptera, Hemiptera, Orthoptera and Neuroptera, for the cabinet which he is now preparing for the Agricultural College.

Col. Colman said he had a communication, but which he had left at his office of Mr. Isaac A. Hedges, in regard to the trial of a reaper and binder.

On motion of Gov. Woodson, the same was laid upon the table.

Col. Colman presented the following resolution:

Resolved, That in the opinion of this Board the law regulating the printing and publishing of the Reports of this Board be so amended as to increase the number of copies to be issued by cheapening the binding; and that a committee be appointed to present this matter to the attention of the members of the next General Assembly.

After discussion by Gov. Woodson, Husmann, Bush and Colman the same was adopted.

On motion, the Board then proceeded to fill vacancies.

Messrs. Kinney and Hall acting as tellers.

A ballot being had to fill the vacancy occasioned by the expiration of the term of service of Henry T. Mudd, resulted for Henry T. Mudd seventeen (17) votes, all the votes cast; whereupon Henry T. Mudd was declared duly elected.

The Board then proceeded to fill the vacancy occasioned by the expiration of the term of service of Wm. Stark.

Gov. Woodson nominated J. L. McCullough, of Gentry county.

Mr. Eli nominated Mr. Stark, and

Mr. Hall nominated J. A. Storm, of Buchanan county.

First ballot resulted:

Mr. McCullough	7 votes.
Mr. Stark	3 "
Mr. Storm	5 "

No choice; whereupon a second ballot was ordered, which resulted as follows:

Mr. McCullough	11 votes.
Mr. Stark	3 "
Mr. Storm	3 "

Whereupon Mr. McCullough was declared duly elected.

The Board then proceeded to fill vacancy of J. J. Squiers.

Mr. Squiers stated that he had changed his business, and therefore declined being a candidate. He nominated Mr. D. W. Bryant.

Mr. Monteith was also put in nomination. A ballot being had, resulted as follows:

Mr. J. Monteith	9 votes.
Mr. D. W. Bryant	5 "

Whereupon Mr. Montieth was declared duly elected.

The Board then proceeded to fill the vacancy of E. W. Bishop.

Messrs. E. W. Bishop and D. L. Hall, of Jackson county, being in nomination, a ballot was had, which resulted as follows:

E. W. Bishop	5 votes.
D. L. Hall	11 "

Whereupon Mr. D. L. Hall was declarad duly elected.

The annual meeting then adjourned *sine die.*

JOHN H. TICE,
Recording Secretary.

Google

MEETING OF THE NEW BOARD.

ST. LOUIS, December 3, 1874.

Pursuant to a call the Board met for organization, Mr. J. W. Harris in the chair.

The following members were present:

Governor Woodson, Jno. Monteith, N. J. Colman, J. W. Harris, M. V. L. McClelland, Henry T. Mudd, G. W. Kinney, George Husmann, L. A. Brown, Josiah Tilden, D. A. Eli and D. L. Hall.

Absent: J. L. McCullough.

The first business was the election of President.

Governor Woodson nominated Luman A. Brown.

Mr. Monteith nominated N. J. Colman.

Mr. Eli nominated G. W. Kinney.

A ballot being had, resulted as follows:

For Mr. Brown	4 votes.
" Colman	5 "
" Kinney	2 "

There being no choice, a second ballot was ordered, which resulted:

For Mr. Brown	5 votes.
" Colman	5 "
" Kinney	2 "

There was no choice.

Mr. Kinney absolutely declined and requested that his name be withdrawn.

Mr. Eli then withdrew the name of Mr. Kinney.

A third ballot was then ordered, which resulted as follows:

For L. A. Brown	6 votes.
" N. J. Colman	5 "

Whereupon Mr. Luman A. Brown was declared duly elected President for the ensuing year.

Mr. McClelland conducted Mr. Brown to the chair, and in appropriate terms returned thanks to the members of the Board for the honor conferred upon him.

The next business in order was the election of Vice President.

Mr. Harris was nominated, but declined the nomination, and nominated Henry T. Mudd.

A ballot was had, which resulted as follows:

For Mr. Mudd	11 votes.
" Harris	1 "

Whereupon Henry T. Mudd was declared duly elected Vice President of the Board for the ensuing year.

The Board then proceeded to the election of Corresponding Secretary.

Mr. Marmaduke was put in nomination.

A ballot was had, which resulted as follows:

For Mr. Marmaduke....................................12 votes.

Whereupon J. S. Marmaduke was declared duly elected Corresponding Secretary for the ensuing year.

The Board then proceeded to the election of Treasurer, which resulted as follows:

Wm. T. Essex....................................12 votes.

Whereupon Wm. T. Essex was declared duly elected Treasurer for the ensuing year.

The Board then proceeded to elect a Recording Secretary.

J. S. Marmaduke being in nomination, a ballot was had, which resulted as follows:

For J. S. Marmaduke....................................12 votes.

Whereupon J. S. Marmaduke was declared duly elected Recording Secretary for the ensuing year.

Mr. Mudd submitted the following resolution, which was adopted:

> *Resolved*, That the order of the Board allowing compensation to the Recording Secretary, be and the same is hereby rescinded; this order to take effect from and after the first day of February next.

Mr. Mudd gave notice, as required by the by-laws, that at the next annual meeting he would offer a motion to abolish the office of Recording Secretary, and to amend all the by-laws that now read "Recording Secretary" so as to read "Corresponding Secretary."

Mr. Hall suggested that it would be necessary, to carry out the object of the resolution adopted, about offering premiums, etc., to take some further action.

Governor Woodson offered the following resolution:

Resolved, That it is the duty of the officers of this Board to make all the necessary preparation for carrying out the intent of the resolution in regard to district fairs and district conventions.

Mr. Tice, Recording Secretary, suggested that several committees which had been designated had not been appointed.

Whereupon Messrs. Hall, Kinney and Mudd were appointed a Committee on Revision of Corresponding Secretary's Report; Messrs. Monteith, Colman and Harris, a Committee to present subjects for discussion, and to procure essays for the next annual meeting.

Mr. Harris offered the following resolution, which was adopted:

Resolved, That the thanks of this Board be extended to his Excellency, Governor Silas Woodson, who has, for the past two days, turned aside from his regular duties to attend the meeting of the Board, and who has contributed so largely to its interest.

Col. McClelland submitted the following resolution, which was adopted:

Resolved, That the thanks of this Board are due and hereby tendered to Col. Norman J. Colman, President, Maj. J. W. Harris, Vice President, and John H. Tice, Recording Secretary, for the zeal and fidelity with which they have discharged their official duties.

On motion, the Board then adjourned *sine die*.

JOHN H. TICE,
Recording Secretary.

ANNUAL REPORT

OF THE

CORRESPONDING SECRETARY

FOR THE YEAR 1874.

REPORT OF CORRESPONDING SECRETARY.

St. Louis, Mo., December 3, 1874.

To the President and Members of State Board of Agriculture:

Gentlemen — In obedience to the law, I have the honor to submit herewith my Annual Report for the year 1874.

Very respectfully,
JOHN S. MARMADUKE,
Corresponding Secretary.

NOTE. — The Corresponding Secretary is indebted to the following named gentlemen for letters giving information concerning their respective counties. It is from those letters that the reports of counties herewith were in part made :

Adair—E. M. C. Morebeck, * *. Andrew—Jack Kimbertin, Rochester. Buchanan — W. F. Wallingford, DeKalb. Callaway—Edward Rackliff, M.D., Cedar City; J. F. Jones, Aux Vasse; B. F. Murray, New Bloomfield; A. Reers, M.D., Black Oak. Cass — W. A. Smith, East Lynne; P. C. Homey, * *; H. L. Hewitt, Austin. Cedar— E. W. Montgomery, Cane Hill. Clark — D. N. Lapsley, Kahoka. Clay — Dan. Carpenter, Barry. Clinton—Erven C. Hale, Willow Park; A. J. McCraynor, Plattsburg. Cole — Frank M. Dixon, Jefferson City. Cooper — W. R. Baker, Lone Elm; W. W. Trent, * *. Crawford—James Asher, Clinton Mills. Dade—R. A. Workman, Greenfield. Dallas — G. A. Howerton, Long Lane. Daviess — Israel Coen, Jamesport; Lewis Dowell, Bancroft. DeKalb—G. E. Shultz, Havana; John McClure, Greenleaf; G. Pittman, Fairport; Horatio Morris, Winslow. Douglas—W. Pryon, Pryon's Store. Dunklin — W. G. Bragg, Kennett. Gasconade—Henry Reed, Canaan. Gentry— James Shillinglaw, Denver (Worth co.); W. H. Rogers, * *; J. A. Mauring, Havanna; A. J. Clark, Gentryville; Levi Long, Mt. Pleasant; H. M. Brown. Mt. Pleasant. Grundy — C. Skinner, Ironton. Holt — Bennet King, Oregon; W. Kaucher, Oregon. Iron — Cam, Belleview. Laclede — J. H. McDonald, Lebanon; L. R. Rupards, Hazle Green. Macon—W. B. Martin, College Mound. Maries—D. L. Dodds, Vienna; M. B. John, * *. Marion—W. R. Anderson, Palmyra; J. K. Martin, Philadelphia; Rufus M. Brown, Palmyra; W. A. Stusey, * *; A. Brown, Palmyra. Mississippi — L. S. Smith, Bertrand. Monroe — George W. Cunningham, Paris. Montgomery — E. R. Brown, Montgomery City; D. F. Mitchell, Jonesburg. Morgan — W L. Abney, * *. New Madrid—Jas. S. Barnes, New Madrid. Nodaway—M. B. W. Harman, Pickering;

Salomon Shell, Maryville; H. B. Luce, Maryville. **OREGON**—J. N. Woodside, Thomasville. **OSAGE**—Lucien Philbert, Dauphin. **OZARK**—James Price, * *. **PETTIS**—P. T. Davidson, Sedalia; Thom. Ellison, Smithton. **PHELPS**—W. B. Tallman, Rolla; Jas. W. Robertson, St. James. **PLATTE**—J. M. Shepard and Jno. White, Flag Spring; James Adkins, Platte City; R. P. C. Wilson, Platte City. **POLK**—John Carson, Bolivar; M. V. Mitchell, Morrisville; James A. Race, Bolivar. **PULASKI**—O. J. Ryther, Iron Summit; John McCurdy, St. Annie. **PUTNAM**—A. D. Thomas, Terre Haut. **RANDOLPH**—Benj. R. Boucher, Cairo; W. Quayle, Moberly. **RIPLEY**—Benj. Hassel, Doniphan. **ST. CLAIR**—W. H. Fillery, Collins. **St. FRANCOIS**—Jos. M. Anthony, Fredericktown; F. E. Clay, * * *. **STE. GENEVIEVE**—J. R. Prichard, Bloomsdale. **SCOTLAND**—H. T. Dolson, * * *. **SHELBY**—J. B. Randol, High Prairie Home. **SULLIVAN**—Allen Gillespie, Browning. **VERNON**—M. L. Modrel, Little Osage. **WARREN**—D. P. Dyer, Warrenton. **WASHINGTON**—Jas. S. Elveny, Caledonia. **WRIGHT**—E. B. Griffin, Hartville.

INTRODUCTION.

It is a fact that must be admitted by every candid and close observer, that the majority of the people of a State are substantially ignorant of its history and its resources. It is a still more remarkable fact that the greater part of the people of a county are badly informed concerning the resources of their own county. Suppose that every man resident of the State of Missouri was intelligently informed concerning his own State—its agricultural, mineral and manufacturing condition—what valuable information could each possess for his own benefit, and how valuable it would be in furthering the great interest of the State. The purpose of this article is to give a brief general history of the State as a whole, and then to give a succinct statement of each county. It is neither the province nor purpose of this article to discuss the *politics* of the State nor to enter into a history of individuals, but to give such facts as may be useful knowledge to those residing in the State and to those wishing to immigrate to it. Thousands of our citizens are engaged in a certain class of farming in one section of the State, who, if they could apply the same industry and intelligence in that specialty in some other section of the State, would much more profit by their labor, and the reason is patent—for there are portions of the State much better adapted to the specialty of wheat growing, for instance, than others—to sheep raising, or tobacco planting, etc., etc.

There are tens of thousands of people eking out a scant existence at this and that sort of farming in other States and in foreign countries, who, if they knew the great resources of Missouri and the superior adaptation of its different parts to the special callings of the farmer, would gladly and quickly seek homes among us and greatly improve their condition. It is with this view that this article is prepared.

The short histories given of each county are culled from letters received from citizens of the counties. *Full a thousand letters have been sent to persons resident in the State, distributing them as well as possible over each county, inviting and urging them to give the Secretary of the State Board a "full and faithful report" of their county saying "it will enlighten the people, improve agriculture, cause immigration and enhance the value of lands." The responses to these letters have been, in a few cases, very excellent, in most cases too meagre, and from some counties no answers at all.* This imperfect response, and sometimes no response at all, must be indifference or negligence. The consequence is that the Secretary of the Board has to gather his information from other and more imperfect and less reliable sources than if he had it full and fresh from the intelligent and truthful reports written by men in the county. Hereafter it is to be hoped the earnest and enterprising citizens of each county will not allow their counties to be thus neglected and harmed.

MISSOURI.

The territory between the parallels of 36° 30′ and 40° 30′ north latitude, and between the meridians of 12 and 17° 30′ west from Washington City, constitutes the State of Missouri. This is about 318 miles long by 280 broad, and covers an area of 65,380 square miles, or 41,824,000 acres. This territory, some two centuries ago, was first explored by the French, who gave the name of "Louisiana" to all the territories south and west of Canada.

November 3, 1762, France ceded this territory to Spain; October 1, 1800, it was ceded back to the French Republic, and in 1803 Napoleon, as First Consul, sold it to the United States. On the admission of the State of "Louisiana" into the Union (1812), the name of the territory north of that State was changed from "Louisiana" to "Missouri." In 1821 the Territory of "Missouri" was admitted as a State into the Union.

Situated as Missouri is in the heart of the great Valley of the Mississippi—perhaps the grandest and richest valley in the world—centrally located as between the northern and southern, as well as eastern and western boundaries of the United States, her whole eastern border washed by the Mississippi, and the Missouri river running from west to east nearly centrally through her; possessing other navigable streams reaching to every point of the compass; with a network of railroads all over the State; with a soil not surpassed, perhaps not

equalled in quantity and quality for agricultural pursuits by that of any other State in the Union; with mineral resources absolutely marvellous; with a climate admirably adapted to health and vigorous work; with a position lying along the great water-way from the lakes to the Gulf, and in the great central road-way from the Atlantic to the Pacific—with all these great possessions it is not surprising that her progress since she joined the sisterhood of States should have been so great, and it will be suprising if her *future* is not more grand than her *past*.

HISTORY OF COUNTIES.

ADAIR COUNTY.

This county, organized January 29, 1841, is situated in the northeastern part of the State. The surface of the county is about equally divided between prairie and timber, the former as rich and productive as can be found anywhere—the latter covered with heavy timber, such as oak and walnut. The cleared timberland is fully as productive as the prairie, and many fine farms are located on it. The Chariton river, belted with heavy timber on both sides for several miles, is the principal water course, passing from north to south through the center of the county, and its many tributaries, meandering in different directions through the county, and all skirted by heavy timber, afford the the necessary water for domestic and stock use. Pure water is obtained everywhere by digging about 20 feet deep. Timber is yet sufficient for all practical purposes. Of minerals, coal is found in this county in great abundance for all coming generations. The county had in 1870—96,399 acres of improved land; 91,574 acres of woodland and 49,601 acres of other unimproved land. The prices of land vary considerable, according to location, quality of soil and kind of improvement, but are at present quite low. The leading occupation of the 11,448 inhabitants is agriculture. Grain of all kinds (the soil being well adapted to them) yield good crops, and no county in the State yields better crops of timothy and Hungarian grass than this. Hay is one of the staple products. Stock-raising is most profitable, and many farmers have turned their attention to this branch of husbandry. The number of improved breeds of all kinds of animals, which have been successfully imported, is considerable, and great numbers of cattle and hogs are annually exported. Orchards succeed well, and considerable attention has been paid to the culture of apples, pears, cherries, peaches, plums, etc. The facilities for markets are good—consisting in the S. L. K. C. U. R. R., crossing the county from north to south, having nearly 25 miles of track, and the G. M. & P. R. R., having nearly 14 miles of track. These railroads furnish a southern, eastern and northern outlet for the commodities for export, which are mainly grain, baled hay, timothy seed, cattle, hogs, etc. Shortly after the war, there was a considerable influx of immigration to this county, mostly farmers from the eastern and northern States.

As in all other counties, this influx of immigration has almost ceased of late, on account of the opening and settling of the western States, the scarcity of money, the general depression of business, and the less numerous immigration from Europe. At Kirksville, (the county seat) is located the State Normal School for the northern district of Missouri. The new structure is an ornament to the State, and is one of the best furnished of any similar buildings in the United States. As will be seen by the annexed table, the county is well furnished with public school houses, and much interest is being taken in having competent teachers.

ANDREW COUNTY.

Andrew county is one of the six northwestern counties forming the Platte purchase, from which in 1836 the Indians were removed by act of Congress. The surface of this county is generally gently undulating; the southwestern part, bordering on the Missouri river, is hilly. Yet not too much so for farming purposes, being probably the best wheat and fruit land in the county. The county is about equally divided in respect to timber and prairie. The principal timber is black walnut, red and white elm, hickory, oak, maples, cottonwood, mulberry and hackberry—sufficient for the use of the county. The soil is mostly a dark clay loam resting on a clay subsoil, and remarkable for its fertility. Andrew county is strictly an agricultural county, no coal, iron or lead being as yet discovered. Good limestone conveniently located in the hills and bluffs and brick and potter's clay are found in abundance.

The census of 1870 gives 111,414 acres of improved land; 79,073 acres woodland, and 54,944 acres of other unimproved land. Improved farms are selling at from $15 to $50 per acre, according to improvements and vicinity to county seat and railroads; unimproved from $8 to $20 per acre, owing to same causes. The price of land has more than doubled since the war, but within the last three years has receded, owing to several reasons, such as partial failure of crops, small emigration, and contraction of the volume of currency.

The leading occupation of the 15,137 inhabitants (census of 1870) is agriculture. There are three woolen factories, one cheese factory, doing a good business in superior cheese; one plow factory and several wagon factories in the thriving towns. Several rivers, such as the Platte river, afford excellent mill-sites every 5 to 10 miles; there are now eight water and three steam grist mills, and also a large number of saw mills in the county.

The leading cereals rank: corn, average yield this year, 15 to 18 bushels per acre, (one-third of a crop); wheat, 20 bushels per acre; oats, 38 bushels per acre; barley, 18 bushels per acre. The principal articles for export are hogs, cattle, wheat, oats, corn, rye, barley, mules, horses and butter.

Andrew county is well adapted to stock-raising, and considerable attention has been paid to this branch, except to sheep husbandry. The farmers show a commendable spirit in introducing finer blood, such as Durham cattle, Berkshire and Magee Swine. Blue grass, timothy and clover, are largely used for pasture and hay, the latter often producing three tons per acre of hay. Few cattle will be fattened this year, not much more than three hundred, instead of as many thousands in former years, owing to the poor crops of the last two years.

This is a fine fruit country—apples, pears, peaches, grapes and small fruits grow to perfection, and everywhere fine and numerous orchards are found, and it is not uncommon for farmers to sell 5 and 7 hundred dollars worth of apples yearly. The demand for fruit north and west keeps ahead of supply.

The Chicago branch of the Kansas City, St. Joseph and Council Bluffs R. R. runs south and north through the center of the county, connecting with the main track at Amazonia, the latter following the Missouri river. These two roads give an excellent market to St. Louis, Chicago, St. Joseph and Kansas City. There are but few sub-districts in this county that have not tolerable good school houses, and much interest is taken by the citizens on the subject of education. (See table.)

ATCHISON COUNTY.

This county, forming the extreme Northwestern corner of the State, is a part of the Platte purchase, and was organized February 14, 1845, from a part of Holt county. The greatest body of the land is rolling prairie. It can well be divided into three natural belts: *First*, the Missouri bottom, which is from 3 to 6 miles wide; *second*, a bluff and timber belt situated between the bottom land and the rolling upland prairies, which, comprising the whole eastern portion form the *third* belt. The bottom land is by far the most fertile portion of the county; the bluff belt furnishes most of the timber used in the county, and is best suited for fruit-culture, while the prairies are all fertile, yet scarce of timber. The climate, though a little rigorous in winter, is good and healthy. Coal has been found in this county, but no effort has been made to develop it. No other minerals have been discovered.

Atchison county contained in 1870 (census) 68,298 acres of improved land; 30,311 acres of woodland, and 46,609 acres of other unimproved land. The average price for improved farms is about $25 per acre; unimproved lands range from $5 to $10 per acre; timberland from about $20 to $40 per acre; according to quality and convenience to prairie districts. The value of lands have about doubled since the war, but receded somewhat of late, owing to decreased immigration, which took place from Iowa, Illinois and other northern States, forming about one-fifth of the population in the last eight years. Agriculture is the principal, almost sole occupation of the 8,440 (census 1870) inhabitants. There are in the county several good merchant mills, driven by water and some by steam, but no other manufactories of any importance. Corn is the leading agricultural staple, though both winter and spring wheat, barley, oats, rye, etc., do well. Wheat, rye and barley are exported; most of the corn is fed to hogs and cattle, which are the principal articles of export. The average yield in 1874 was—of corn, about 20 bushels; fall wheat, 20 bushels; spring wheat, 23 bushels; oats from 40 to 50 bushels per acre. The crop of small grain was a fair average; corn was about one-third of a crop.

The county is well adapted to stock-raising, having an abundance of water and natural grazing lands. Little effort has been made to secure tame grass for pasturage, though blue grass is found growing luxuriantly as a volunteer. But little attention has been paid to improved breeds. The stock law was voted down at the late election. Cottonwood plank fencing is mostly in use on newly improved farms. It costs about

$500 a mile, and only lasts from 5 to 8 years. Osage orange hedges succeed well. Orchards are nurtured successfully, but only the hardier varieties of fruit grow to great perfection. Budded peaches do not succeed well, though seedlings yield quite abundantly. The Kansas City, St. Joseph and Council Bluffs Railroad, running along the Missouri river, through the southern and western parts of the county, is the principal facility for transportation to markets. St. Louis and Chicago are the principal markets for small grain—Chicago for live stock, excepting in packing season—when hogs are shipped to St. Joseph. The progress of education in this county continues, and there is a marked improvement each year, and, as can be seen by the table, the county is well supplied with good schools and competent teachers.

AUDRAIN COUNTY.

This county is situated in the northeast central part of the State, on the divide between the Missouri and Mississippi rivers; it was organized December 17, 1836. The general surface of the county is rich, rolling prairie, well diversified with timber and watered by many streams, thus affording the necessary water for domestic use and stock, but little or no water-power. The soil is principally a clayish loam, underlaid with a clay subsoil, retaining well the moisture. A liberal amount of sand makes the soil warm up early in the spring. Timber is still abundant for all necessary purposes, and will, with proper care, prove adequate to all future demands. Bituminous coal of good quality underlies large portions of the county, cropping out in many places near the surface, and is thus easily obtained by drifting. Only few mines are as yet worked. It is believed that cannel coal exists in large quantities in the northern part of the county. The manufacturing establishments are a fine flouring mill and one woolen factory at the county seat, and several saw and grist mills in the county. The United States census of 1870 gives 191,087 acres of improved land; 89,515 acres of woodland, besides 43,715 acres of other unimproved land. The price of improved land averages about $20 per acre, and of unimproved land from $5 to $10 per acre. The leading occupation of the 12,307 inhabitants (1870) is agriculture, and the principal farm products are hay, corn, wheat, oats and potatoes, which are grown successfully, and usually in large quantities; other cereals and vegetables only to a limited extent, for home consumption. Tobacco was formerly the leading production, but its culture has been almost abandoned. The leading business of the farmers in this county is stock-raising, and great numbers of neat cattle, hogs, mules and horses are raised for market. Improved stock has been introduced with great success. This being both a grazing and agricultural county, with thousands of acres of wild prairie untouched, a stock law is not wanted by a majority of the farmers. All kinds of fences are in use, rail and plank fences more than any other. Osage orange hedges are quite extensively cultivated, and give, generally, satisfaction. Fruit-growing has of late more generally received the proper attention, the soil and climate being well adapted to the growth of all kinds of fruit-growing in this latitude, and some large and fine orchards are now yielding rich crops of good fruit. The same may be said of grapes, which also succeed admirably. The county is well supplied with facilities for transportation, having two lines of railroad—the St. L. K. C. & N. R. R. runs through the entire length of the county from east to west, and the C. & A. R. R. from northeast to southwest. Chicago and St. Louis are the principal markets. Audrain county received a fair portion of the immigration, which was mostly from the Eastern and Middle States. The county has many fine school houses and competent teachers, as will be seen by the table. The "Hardin College," for young ladies, founded through the munificence of Hon. Charles H. Hardin, is located at Mexico, the county seat.

BARRY COUNTY

Is situated in the southwestern part of the State, and is bounded on the south side by the State of Arkansas. It was organized January 5, 1835, but was reduced to its present limits January 24, 1849. The general surface is rolling or undulating, in some places broken, being traversed by the Ozark Mountains. The soil is of various kinds, from the rich alluvial bottoms to the more thin or ridge land upon the uplands. The county is covered with timber, there being but very little prairie proper, and this rather small. Timber is abundant for all purposes of fencing, building and railroad ties; the A. & P. R. R. Co. used large quantities of it to repair and construct their road and branch lines. The county has a very fair supply of water-power on the White river and Roaring river—the latter bursts from the earth a river, driving, a few feet from its head, a fine flouring-mill. Lead has been found in several localities, but as yet not in paying quantities; it is thought to exist in large and paying quantities, as all indications are favorable. Coal has not been discovered as yet. The climate is healthy and mild. There are several good flouring-mills in the county, and also three carding-mills and one steam saw mill at Washburn. There are 37,518 acres of improved land; 66,180 acres of woodland, and 984 acres of other unimproved land. Improved farms sell for $25 per acre; unimproved from $1 to $5 per acre. The price of land has advanced since the war, on account of immigration and better methods of farming being introduced; the population is now more settled and permanent. The leading occupation of the 10,373 inhabitants (census 1870) is agriculture. The principal farm products are wheat, corn, rye, oats and potatoes, of which wheat and corn form articles of export. The crop of wheat in 1874 was excellent, better than any since the war; corn and oats did not succeed so well, on account of drouth and the Chinch Bug; yet land well tilled has produced forty bushels per acre, standing the drouth remarkably well. The average yield of wheat is about twenty bushels; oats, twenty-five bushels; hay, one ton; Irish potatoes, sixty bushels; and sweet potatoes one hundred and fifty bushels per acre. The soil and climate is well adapted to the last mentioned vegetables, often producing four hundred bushels per acre. Cotton and tobacco do well, but are only raised for home consumption. Barley is little grown—it is thought to spread the Chinch Bug. Rye, hemp, flax, broom-corn and sorghum are successfully grown to a limited extent. Considerable interest is taken in the introduction of improved stock, and when tried, has been a success. Sheep-raising is profitable, but dogs and wolves do much damage, and ought to be disposed of as a nuisance by the Legislature, the former by a heavy tax, and the latter by offering a larger premium on their scalps. A stock law is not desired by any considerable number of the farmers. Rail fences are in general use.

Having an abundance of timber, hedges have not been tried to any extent. Fruit of all kinds succeed well, and many young orchards have been planted. The products of Barry county are taken to the A. & P. R. R., at Pierce City, or towns on the extreme northern border, and then shipped to St. Louis. The educational interests are receiving increased attention, and (see table) the county is well supplied with school houses.

BARTON COUNTY.

This county is situated in Southwest Missouri, adjoining Kansas, and was organized from the northern part of Jasper county, December 12, 1855. The county is decidedly a prairie county, only about one-eighth part being timberland, situated on the numerous streams. The prairies are mostly gently rolling, with a soil of sandy loam with clay subsoil. The Ozark Divide, running through this county, forbids there being any important streams of water, but there are many small creeks offering ample stock water, but no good water-power. There is yet sufficient timber to meet the necessities of the people, but not enough to supply future wants, even if none were needed for the purposes of railroad lines. Bituminous coal of good quality underlies the whole county, and is in some places so near to the surface as to be easily mined. Quarries of sandstone of good quality, and limestone for the manufacture of lime are found in various parts of the county. The climate is healthy and mild; the winters are short and temperate. This county being strictly an agricultural county, but few factories are found, except small blacksmith shops and one flouring mill at the county seat. Several more are needed. The county had, in 1870, 41,056 acres of improved land; 13,417 acres of woodland, besides 44,613 acres of other unimproved land. The price of land is low, inviting immigration. The census of 1870 gives 5,087 inhabitants.

The leading agricultural productions are corn and wheat—the county being unsurpassed in the production of the latter cereal. Flax, oats, rye, potatoes, etc., are raised in sufficient quantities to supply the home consumption. The cultivation of flax has acquired quite large dimensions already, and considerable quantities will be raised this year (1875.) The wheat crop of 1874 was good, while the corn and other crops were destroyed by the chinch bugs and the drouth. The average yield is usually—of corn, 40 bushels; of wheat, 20 bushels per acre. Tobacco, timothy, blue grass and clover succeed very well, and are good investments for the farmer.

Barton county is extremely well adapted to stock-raising; but a slight shelter and feed are needed on account of the mild winters. Notwithstanding the drouth, the pasturage on the prairies has been good all summer, and large quantities of wild hay have been secured. Considerable numbers of cattle and hogs are raised, and the farmers are rapidly improving their stock, so that the well known face of the "Prairie Alligator" breed of hogs are fast disappearing. Sheep-rearing has proved profitable, with careful men, and not much injury is done by wolves, but dogs are much feared. A majority of the farmers do not desire a law to restrain cattle from running at large. This subject is much discussed, and it is possible that the public sentiment in reference to this matter may soon change. The Osage orange does admirably for hedging, and large amounts of it are planted annually, instead of the costly rail fences. There is not sufficient timber to fence all the prairie lands. The county is excellent as a fruit county, grapes and berries of all varieties being indigenous to the soil and climate. The orchards are yet young, but promise well. The exports are generally marketed in St. Louis, though some flour is sent to Texas. Being situated midway between two competing railroads, the freights to and from the county seat are low. Before another year has elapsed there will probably be a railroad through the county seat, a road that will give an outlet to the Mississippi river below freezing point.

The people of this county are determined to have good schools, and the cause of education is prospering finely. (See table.) Lamar has a graded school of four departments.

BATES COUNTY.

This county, situated in the western part of the State, on the Kansas State line; was organized January 29, 1841. About four-fifths of the county is gently rolling prairie, and the rest timberland. This latter is bordering the many streams which traverse the county in every direction, affording all the necessary water for stock, etc. On some of the larger streams are good sites for mills. The principal timber is oak, walnut, hickory, sycamore, etc., and is found in sufficient quantity to supply the present wants. The soil is excellent, and admits of very general cultivation; scarcely an acre of waste land can be found in this county. Coal is the only mineral found in the county; it is found abundantly at a depth of from one to ten feet from the surface; a vein has been found at a depth of 73 feet, with a thickness of 6½ feet, and enough coal is dug to supply the home consumption. Coal is underlying nearly the whole county. The climate of Bates county is excellent.

The county contains (census of 1870) 113,579 acres of improved land; 53,050 acres of woodland, and 109,379 acres of other unimproved land. The average price of farms is now not more than $15 per acre, and of unimproved land about $7 per acre; of timberland, from $8 to $25 per acre, according to location. These low prices are accounted for by the general depression of the times and less immigration, which is going further west, having opportunities of getting cheaper lands. The prices of farms, in consequence, have decreased from $40 per acre, the price a few years after the war. This county, being strictly an agricultural county, only few manufacturing establishments are found within its borders, comprising some 5 flouring-mills, about 8 or 10 saw-mills, 2 woolen factories, and 2 agricultural implement factories. The population, according to census of 1870, is 15,960. Corn, wheat and oats are the chief productions; cattle and hogs and a few sheep are about all that is shipped. The crop of 1874 is nothing compared with that of other years, and would not do to average by. The average yield of corn is about 40 bushels per acre; wheat, 20 bushels, and oats, 40 bushels. Tobacco and cotton are cultivated, for home consumption; the cultivation of the former could be made remunerative, the climate and soil being well adapted for it. Barley, rye, potatoes, etc., grow to perfection. Blue grass is a natural production of the soil, growing luxuriantly where the wild grass is killed out. Improved breeds of all kinds of stock have been introduced with marked success, the county being well adapted to stock-raising. Sheep husbandry has been made quite remunerative since the farmers came to the conclusion that buck-shot at fifteen cents per pound is the cheapest remedy for the pest of prowling mongrels.

All kinds of fences are used, but mostly rail and hedge fences. The Osage orange is extensively planted for fencing, and is doing well.

There are but few orchards bearing at present; many are being planted and promise well. Small fruits and the grapes, chiefly the latter, are grown by almost every farmer, with a good result, for home consumption.

Bates county has ample facilities for transportation, the L. & G. R. R. running near the eastern border, and the M. K. & T. through the eastern part of the county.

The people in this county are making their best endeavors to keep step with this progressive age, and the school houses (see table) do ample credit to the people of the county.

BENTON COUNTY.

This county, situated in the southwest central portion of the State, was organized January 3, 1835. The Osage river runs through the centre of the county, from west to east, and is navigable about three-fourths of the year. Grand river, Big Tebo, Pomme de Terre, Cole Camp and Turkey creeks empty into the Osage river in this county. They are large streams, furnishing good water-power. About two-thirds of the surface of Benton county, lying along the river, is generally broken, with some good uplands and very rich bottoms; one-third, comprising the north and northwest part, is rolling, fertile, prairie land. A considerable portion of the roughest part of the county, being well set in wild grass and having a good supply of water, is well adapted to grazing.

Benton county has an ample supply of hard wood timber of all kinds.

Coal is found in several places in the northwest part of the county, but is not worked. Lead is found in a great many places, and has been mined to a small extent for market, Sulphate of baryta is here in great abundance. Zinc and copper have also been found. The great mineral staple of the county is iron, of which ore there are abundant leads of brown hematite or limonite, and red hematite, and some specular. Some banks have been worked, but abandoned, there being no sale for the ore.

The county has 79,940 acres of improved land; 134,413 acres of woodland, and 26,175 acres of other unimproved land. The prices of land rose from 1865 to 1869, about 200 per cent., but are now comparatively low, since immigration has almost ceased. Many thrifty farmers from the Northern States settled in this county during these years, so that it has more than doubled its population since the war. Wild prairie land sells from $5 to $10 per acre; improved farms from $10 to $30 per acre; uncleared bottom land from $8 to $10 per acre.

The leading occupation of the 11,322 inhabitants (census 1870) is agriculture. There are seven flouring-mills, and about the same number of saw-mills in this county. A few carding machines and blacksmith shops complete the list of manufactories.

Agricultural staples are corn, wheat hay and oats, of which wheat alone is exported. The crops of 1874, except of wheat, were the poorest ever grown in the county, the average yield of corn being three bushels instead of the usual average of thirty bushels; of wheat, twelve bushels, per acre. The drouth and chinch bugs have been fearfully destructive. Tobacco, cotton, broom-corn, sorghum, sweet potatoes, etc., are grown with success for home use. The uplands are thought to be excellent for the culture of tobacco. A considerable amount of flax was sown this year, and did well; more will be sown the coming summer, it being proof against the Chinch Bug. Cultivated grasses have not been used to any extent for pasture; blue grass springs up spontaneously about old farms.

On account of the scarcity of feed, very few cattle and hogs will be fattened this year, and many hogs have been sold and shipped to Illinois and Iowa to be fed there. Improved breeds, such as short-horn cattle, Berkshire, Chester and Poland China hogs are common. Sheep husbandry would be a success but for the dogs. There being an abundance of timber in this county, worm fences are mostly used, while hedges are generally grown in the prairie with good success. Orchards invariably do finely when proper attention is paid to them. Most of the stock and produce is shipped from Windsor, in Henry county, via the M. K. & T. R. R. to St. Louis. Comparatively but little use is made of the Osage river, which affords abundance of water for boats for a great part of the year.

The schools in this county (see table) are in a prosperous condition, and they receive the hearty and earnest support of most of the prominent citizens.

BOLLINGER COUNTY.

This county, organized March 1, 1851, is situated in the southeastern part of the State. The general appearance of it is broken, with fine valleys and level land on top of the hills, and which are generally clear of stones, while the sides of them are very rocky. The county is decidedly timbered, being covered with the different kinds of oak, hickory, black and white maple, elm, walnut, ash, gum, poplar and sassafras. The valleys are very fertile. The county is best adapted to fruit-culture. It is well watered by many small rivers, creeks, etc., which afford good water-power.

Iron ore is found in great abundance, some of the hills being almost nothing but iron; but as yet very little or nothing has been done to develop the mining districts. Very little is being mined and shipped to St. Louis and other points. Lead has also been discovered.

The climate is mild and healthy. There are (census 1870) 42,009 acres of improved land and 143,514 acres of woodland in this county. The prices of improved farms is from $5.00 t[illegible]$15.00 per acre, according to improvement and quality of land. Unimproved lands can be bought for $3.00 to $5.00 per acre. The price of land has decreased of late, owing to stringency in money matters, the partial failure of the wheat crops in 1870, 1871, 1872 and 1873, and the damage done to crops during these years by the Chinch Bug.

This being an agricultural county, very few manufacturing establishments are to be found, except five flouring mills, one wool-carding machine, one stave factory, giving employment to about fifty men, and several blacksmith and wagon shops. There are also a few tanneries in Bollinger county, and offers a very fine opportunity for a business of that kind, there being splendid locations, and tanbark in abundance.

The county had, in 1870, 8,162 inhabitants, whose occupation is agriculture.

Wheat and corn are the leading productions, the former being the principal export. The wheat crop of 1874 was more than treble that of 1873; the corn crop, however, less than half of that of 1873. The estimated average of it is about forty bushels per acre. Wheat, on an average, yields twelve bushels (1874) per acre, and oats not more than ten bushels per acre, being killed by chinch bugs and the drouth. Hardly any commercial crops are raised, although tobacco would do well in many places. Cereals and fruits also do well, but are only cultivated to a small extent for culinary purposes. None of the grasses are raised to any extent for pasturage, except red clover, which generally succeeds well.

More attention has been paid lately to the introduction of better stock, and thus far apparently with a good result. A stock law is not wanted by a majority of the people, timber being so plentiful that fences can be built with little expense. The Old Virginia rail fence is principally used. Hedge fencing has not yet been tried, and is not likely to be for some time.

Farmers are generally successful in raising fruit, such as apples, peaches and pears, to which the country is well adapted. Considerable attention has been paid to viticulture, and the wine made finds always a ready market.

The facilities for transportation are the T. M. R. R., or by wagon to the Cape, and from thence by steamer. St. Louis is the principal market.

There has been considerable immigration to this county since the war, mostly Germans and settlers from Tennessee, Kentucky and Mississippi, who find the land very cheap compared to its value.

Much more interest is taken in the progress of education in public schools than formerly, the former opponents to it beginning to see its advantages. The table gives the statistics of the schools in this county.

BOONE COUNTY.

Boone county is located in the central part of the State; it was organized from Howard November 16, 1820. About one-third of it is rich, rolling prairie, the rest is timber, some portions of which are hilly. The surface is sloping from the dividing ridge of the Mississippi and Missouri river southward. The latter borders the south side of the county about forty miles. Boone county being one of the old and well settled counties much of the timberland has been cleared; but there is yet sufficient good timber to supply the demand for years to come.

The county is well watered by many rivers and creeks, affording water-power and a good supply of water for stock. The soil is fertile, rich and variable, a portion being of a mulatto color, and the greater portion a dark loam. The Missouri river bottom, celebrated for its fertility, varies from one-fourth to one and a half miles in width. In many places the bluffs are close to the water's edge.

Iron and coal are found, and several coal mines are in operation, one employing about fifty operatives; the others are yet on a small scale.

The climate, though variable in temperature, is remarkably healthy.

According to the census of 1870, Boone county contained 222,296 acres of improved land; 62,476 acres of woodland, besides 66,657 acres of unimproved land. The prices of land have decreased fully one-half in value since the war. There is no local cause for the decline, but must be attributed to the general stringency of the times, high taxes, caused by internal improvements, scarcity of money, and failure of a general good crop for some years past. The average price of improved farms varies from $12 to $20 per acre; of unimproved land, from $5 to $8 per acre; of unimproved timberland, $2 to $5 per acre; of unimproved prairie land, from $5 to $10 per acre; and of bottom land, $20 per acre.

The manufactories of Boone county are a number of excellent flouring-mills; one woolen factory; one respectable agricultural implement factory; one tobacco factory, and some small shops of different kinds. Of the 20,765 inhabitants, the greatest number are agriculturists.

The leading products are corn, wheat, oats, barley, rye, tobacco. Only wheat and tobacco are articles of export. The wheat and oats crop for 1874 is fully an average with former years; the corn crop is only about one-third as large as usual, owing to extreme drouth, and the tobacco crop a failure. The yield of corn for that year was 15 bushels, of wheat 14 bushels, of oats 25, of hay one ton, per acre. Tobacco is grown extensively on lands contiguous to the Missouri river. Hemp, flax, castor beans, broom-corn, sorghum, sweet potatoes, etc., are grown successfully, but not for exportation. Blue grass, timothy and red clover are extensively grown for pasturage, equal to any county in the State. The county raises every year a very large surplus of stock. Improved breeds of cattle, sheep and hogs, have been introduced quite extensively. Sheep-raising is profitable, but a great loss is annually sustained from dogs. A large number of farmers would like to have a good stock law, but perhaps a majority of the citizens would vote against it.

Rail fences are most generally used, and there is yet plenty of timber for that purpose. Hedges are used to some extent.

The county is well supplied with orchards, and the fruit crop is generally good. Grapes are grown with success, and about 40 acres are cultivated.

The facilities for transportation are railroad and river. The St. Louis and Kansas City Railroad in the north, and the Columbia branch, running through the county, bring this county in close proximity to the markets, which are St. Louis and Chicago.

The public schools in this county are in a flourishing condition, (see table), and not many years will elapse before Boone county will be in the van in educational affairs. There are also a number of good private schools in the different towns, and the University of Missouri and Agricultural College, located at the county seat, Columbia, whose citizen alumni have won for it by their intelligence and culture the classic title of "The Athens of Missouri."

BUCHANAN COUNTY.

This county is a part of the famous Platte purchase, lying in the northwestern part of the State. It was organized February 10, 1839. The county is about half timber, the balance prairie land—nearly all in a high state of cultivation, including pastures. The land is gently undulating, and has a great many fine and lasting springs. The soil is rich and very productive, being a light, sandy loam, with a subsoil of yellow clay which is also sandy, and readily allowing the heaviest rains to percolate to a great depth. The land bordering on the Missouri river, which forms the western boundary line of the county, is hilly, and presents some very fine scenery. Timber is still abundant, and is now being properly cared for—there being much walnut, which is now used in large quantities in St. Joseph for the manufacture of furniture of all kinds, and some is also shipped to other points. The prevailing timbers are oaks, hickories, black walnut, elm, hackberry, and cottonwood in the bottoms. The county is well watered; besides the Missouri river, there are the Platte and One Hundred and Two—the former running through the entire length of the county. On both streams are a number of fine flouring-mills. There is scarcely a section of land without running water.

Except limestone for building purposes, and of which large quantities are used, there is no mineral developed.

The city of St. Joseph, the capital of the county, with a population of over 30,000 inhabitants, has a great number of manufacturing establishments. In the county, there are a number of flouring and saw-mills.

The county has (census of 1870) 91,495 acres of improved land; 21,318 acres of unimproved land, and 58,450 acres of woodland. The average price of land is about $30 per acre, but near St. Joseph it is, as a matter of course, much higher. The price of land has decreased since the war; the main reason of which is the opening of so much cheap land farther west.

The leading occupation of the 35,109 inhabitants, exclusive of the population of St. Joseph, is agriculture.

Wheat, hogs, beef cattle and apples are the leading exports, and in the order named.

The yield for 1874 is about the same as in 1873, but much less than in previous years. The average yield in 1874 was 5 bushels of corn, 12 bushels of wheat, and 25 to 30 bushels of oats per acre. Beans, broom-corn, sorghum, barley, rye, sweet potatoes, Irish potatoes, buckwheat, etc., succeed well, and are chiefly cultivated for home use. Any surplus finds a ready sale in the county. Nearly all the heavily timbered lands are well set in blue grass, and is a decided success; but on lands exclusively oak it is a failure.

The trade in neat stock is large. Several thousands of horses and mules are shipped annually, and also an immense number of hogs. A stock law is not wanted.

Rail fences are mostly used, but also plank and hedge. The Osage orange hedge is a success, but timber being plentiful and cheap, it is not used to any great extent.

Much attention has been paid to fruit culture, and almost every farmer has an orchard. All the different fruits adapted to the latitude of Buchanan county are grown extensively and successfully. Grapes are a decided success, and there is a growing propensity to increase the number of acres; about 60 or 70 acres at present.

The facilities for market are superior—railroads diverging in all directions from St. Joseph. Much of the live stock and grain goes outside the State, both east, west and south.

Immigration has fallen off since the war, but would probably increase again if the superior advantages of Buchanan county were better understood.

The county has excellent schools at St. Joseph, and there is hardly a dwelling in the county more than two miles from a school house; and with very few exceptions, every district has a neat, plain school house, with good teachers, some of which are an ornament to their profession.

For statistics, consult table.

BUTLER COUNTY.

Butler county is one of the extreme southeastern counties in the State. It was organized February 27, 1849. The northwestern portion of the county is broken and rocky; the southeastern part level.

The bottoms of Big Black, Little Black and Cane Creek have a very rich, alluvial soil, and the uplands are peculiarly adapted to small grains, and also to tobacco, which is equal to that of the James river, Va. The country between these rivers, which run almost parallel (south) through the county, is mostly gently rolling upland. The principal timber on these lands is oak and pine—the latter in large quantities. Dense forests of oak, poplar, walnut and maple cover the bottom lands.

The rivers furnish excellent water-power for any investment of capital that might be tempted in this part of the State. The Big Black river, a beautiful, clear stream, is navigable to Poplar Bluff for about six months in the year. The land east of this river is one vast expanse of heavy timbered bottom, denominated swamp, though to a great extent quite dry and easily cleared and cultivated to produce cotton of a fine quality.

Iron is found, but thus far not in paying quantities.

The county has 14,794 acres of improved land; 1,082 acres of bottom land; 68,458 acres of other unimproved land. The price of improved land varies from $8 to $10 per acre; for unimproved land, $4 per acre. Since the war, the prices of land have increased, but are at a standstill at present.

Of late, there has been only little influx of immigration, owing to the cheap land farther west and the failure of crops for the last year. Of the 4,298 inhabitants, most are farmers.

The leading agricultural productions are corn and wheat, of which the latter forms the article for export. Other cereals and fruits succeed well, and are cultivated to some extent, but only for home consumption. Of commercial products, the county raises chiefly cotton. The average yield of corn is 40 bushels per acre; of wheat, 16 to 20 bushels per acre. Tame grasses do well, but are little cultivated, there being an abundance of good, natural pastures.

Stock-raising is profitable, doing well on the range the year through. Comparatively little attention has been paid to the introduction of blooded stock as yet. Dogs, as in so many other counties, are here a serious obstacle to sheep husbandry, which would otherwise be profitable. The stock law finds, as yet, little encouragement.

Rail fences are mostly used. Hedges have not been tried yet; at least, not to any extent.

Butler county is well adapted to fruit-culture, and orchards are springing up everywhere, and are quite successful.

The county has good market facilities. The St. L. & I. M., and the C. & F. R. R., running throug it—the latter forming a junction at Poplar Bluff.

The educational interests are somewhat neglected; but there is an awakening interest in the people on this subject, and a few neat and comfortable school houses have been built during the last year. (See table.)

CALDWELL COUNTY.

This county, organized December 26, 1836, from a part of Ray, is situated in the northwestern part of the State. The greatest portion of it is upland prairie. Its surface is mostly just rolling enough to be adapted to farming without the use of artificial drains. About one-half is prairie and one-half timber, so evenly distributed all over the county that there are few sections of land destitute of wood. Shoal creek runs through the central portion of the county from west to east, and with its numerous small tributaries offers an abundant supply of water for stock. The soil is a deep black sandy loam of great fertility, and there are not 100 acres of nonarable land. The creeks are skirted with timber, so that the supply is ample for all reasonable wants of an agricultural community. The water-power is not very good, and has, owing to the difficulty in damming, thus far been but little utilized. No mineral of any description is found, yet the idea is prevalent that there is coal. The county is well supplied with building stone, such as blue and white limestone. It is cropping out along Shoal creek, underlying the ground at the depth of from three to twenty feet. Since the war, the prices of land have steadily increased, until 1870, since which time it has decreased, and now farms are sold at less than the net cost of improvement. The average price of improved farms is from $18 to $20 per acre; of unimproved prairie land, $7 per acre; of timber, from $10 to $15 per acre. The rich bottom lands of Shoal creek command the highest price and are the most sought after, as they are the richest and most remarkably productive of any in the county, seldom failing to produce a good crop, either in wet or dry seasons. There are many reasons why land has declined in price, and prominent among them are the facts that immigration has been light for the past four years on account of cheaper lands further west, the paralyzed condition of financial matters, and failure of crops on account of drouth and chinch bugs. The census of 1870 gives 115,998 acres of improved land; 45,170 acres of woodland, besides 31,019 acres of other unimproved land. The county has six flouring-mills doing a flourishing business, two of which ship considerable flour to different points along the line of the Hannibal and St. Joseph Railroad; there is also one foundry and machine shop. The 11,390 (1870) inhabitants are mostly engaged in agriculture. The principal productions are corn, wheat, rye, oats and barley, of which wheat and oats are mostly exported. Flax seed has been grown with success. The crop of 1874 is considerably below an average of former years, being only of corn, 8 bushels; of wheat, 10½ bushels; of oats, 30 bushels; of hay, one and and a half tons per acre. Tobacco and cotton are not raised to any extent. Castor beans, broom-corn, sorghum, sweet and Irish potatoes, buck-wheat and beans are all successfully raised, and enough to supply the home consumption and market. Blue grass is only used to a limited extent. The different kinds of grasses are a never failing crop, affording an abundant supply of feed for stock the whole year round. Timothy does fine, often yielding 3 tons of hay to the acre, and clover, winter never kills.

Quite a number of the best breeds of stock that could be procured have been brought to this county within the past two years, and success has generally been the reward. Sheep-raising is carried on only to a limited extent, but the business is on the increase, notwithstanding the troublesome dogs. The stock law was twice voted down.

Fencing is evenly divided, but stands in the following order: rail, post-rail and plank. The Osage hedge does well where not interfered with by the gophers.

All kinds of fruit do well—the greatest obstacle to contend with is the borer. The facilities for transportation is by railroad only. The cattle are mostly sent toChicago; the hogs to Kansas City, and the grain to St. Louis.

The Hannibal and St. Joseph Railroad runs through the northern tier of townships in this county, with depots at Hamilton, Breckenridge, Kidder and Nettletonville.

The citizens of this county may well be proud of their educational facilities. Besides the many good public schools, (see table) there are two graded schools in Breckenridge and Hamilton, which compare favorably with any in the northwestern part of the State.

CALLAWAY COUNTY.

This county is situated in the central part of the State, and was organized November 25, 1820. The surface of the county is agreeably diversified, so much so, that adjoining farms are often wholly dissimilar, both in character and quality. The county dips slighty to the southeast, as is apparent from the course of its numerous streams. Cedar and its branches are in the west, Aux Vasse and its tributaries in the centre, and Loutre on the east. The southern and southeastern boundary of the county is washed by the Missouri river for a distance of about forty miles.

The county has within its borders ten prairies, large and small. About two-thirds of its surface is covered with timber; most of the northern portion, however, is prairie. The soil is very productive, and timber is abundant for all practical purposes.

The mineral wealth is varied and almost inexhaustible. Fire-clay, potters clay, limestone, hydraulic cement and marble, ochre, and other mineral paints abound. The most remarkable deposits of cannel coal known in the world, and inexhaustible beds of fine bituminous coal are in close proximity to immense mines of excellent iron ore, much of which is shipped to other States for manufacturing.

The climate is healthy. The county contained in 1870, (census) 194,990 acres of improved land; 210,288 acres of woodland, and 29,522 acres of other unimproved land. The price of land is far below its real value, selling at from five to fifty dollars per acre, according to improvements, quality and location. The price is not so high now as a few years ago, principally owing to the scarcity of money.

The number of inhabitants in 1870 was 19,202.

Of manufacturing establishments there is one pottery, turning out about two hundred thousand gallons of ware annually; about thirty mills of all descriptions, twenty of them called manufacturing mills—one, a large flouring-mill, recently built at Fulton; one woolen factory and two cheese factories. The leading occupation of the population is agriculture.

Corn, oats, wheat, rye, grass and tobacco, are the principal agricultural staples. Tobacco is raised, manufactured and exported in large quantities, and of very good quality. The crops of the two last years do not compare favorably with previous years, owing to excessive drouths and insect pests of various kinds. The average yield of corn last season, outside of the bottoms, will not much exceed 25 bushels per acre;

wheat, 16 bushels; oats, 40 bushels, and hay from 1 to 2 tons per acre. All the other cereals and fruits are grown with great success, but not to any extent, being only cultivated for home use.

All the valuable grasses are grown with great success. Blue grass seems to be indigenous to the soil, and is gradually crowding out the native grasses.

Considerable attention has been paid to stock-raising, and the introduction of a better class of stock, the county being well adapted to this branch of agriculture. A great number of neat cattle, sheep, hogs, mules and horses are reared annually for market. Sheep husbandry would be still more profitable if the curs could be killed.

The county has no stock law, and only few farmers wish for one.

There being plenty of timber in some parts of the county, the prices for fencing are not very high; in the prairies Osage orange hedges are largely and successfully grown.

All kinds of fruit adapted to the latitude of Callaway county do well with proper attention. Orchards are numerous, and yield an abundance of good fruits. Grapes are grown in all parts of the county, but principally for family use, except near the river, where about 50 vineyards, averaging from 3 to 5 acres each, which produce good wine.

The facilities for transportation to market are good. The Missouri river, the P. R. R. and the N. M. & C. A. R. R. open a market to Chicago and the east, and most of the cattle, sheep, and hogs are sent directly to Chicago.

There was some immigration to the county soon after the war, principally from the northern States, but none recently.

Nearly every sub-district is provided with a comfortable, well furnished school building, (see table,) and the county can boast of many excellent teachers. Besides these public schools, there are two colleges, both located at Fulton.

CAMDEN COUNTY.

Camden county, organized January 29, 1841, is situated in the south central part of the State. The surface of the county is rather hilly, with beautiful woodlands and some few and very small prairies. It contains some of the richest little valleys of the Ozark range of mountains. The greatest part of the county is covered with timber, some good and some bad. Much timber has been wasted in former years, and even now proper care is not generally taken of the remainder. The soil of the valleys is rich, productive and well suited to agriculture, but not so rich as in some of the valleys nearer the Missouri river. The soil on the flinty hills and ridges is also quite fertile when relieved of its burden of flint, and is best adapted to stock-raising and fruit-culture. The county is very well watered by many rivers, large and small creeks, and a great number of fine springs. The Osage river is the principal water course, traversing the entire northern section. An abundance of water-power is found, enough to drive most any kind of machinery.

Indications show very extensive deposits of lead and iron in the hills, but the mining of these metals is still in its infancy, there being at present only a few mines in active operation.

The leading manufactures of Camden county are one lead smelting furnace; one iron furnace, five or six flouring-mills, some saw-mills and wool carding machines, and one wagon factory.

The census of 1870 gives 19,852 acres of improved land; 71,615 acres of woodland, and ——— acres of other unimproved land. Improved land situated on the A. & P. R. R., sells from $10 to $15 per acre; the price of unimproved land is not fixed, depending much on the kind of land and eagerness of the owner to sell.

The leading occupation of the 6,108 inhabitants (census 1870) is agriculture.

Corn, wheat, oats and tobacco are the chief agricultural staples, of which wheat forms the principal product for export. Tobacco succeeds very well, the soil being peculiarly well adapted to its growth, and tobacco is rapidly becoming a staple product. Other cereals and vegetables are successfully grown to a limited extent, and only for domestic use.

The leading pasture of the county is the range. Hardly any tame grasses are cultivated to any extent, although blue grass would grow here finely with proper care, it being natural to the soil.

Cattle and hogs are raised in considerable numbers for market, but mostly of the native variety, not much attention having as yet been paid to the raising of improved breeds. Most every farmer keeping a gang of most useless curs, sheep-raising does not pay, though no county is better adapted to this purpose than Camden county. A stringent stock law is badly needed, but not wanted by a majority of farmers, it seems.

The soil and climate of the county is well adapted to fruit growing, and wherever an orchard has been planted, it has amply remunerated for the trouble. There are no extensive vineyards in the county.

The means of transportation are furnished by the A. & P. R. R. and the Osage river.

The former runs on the southeastern boundary of the county, bringing the surplus products, cattle and hogs to the city of St. Louis, which is the principal market.

There has been no great influx of immigration to this county since the war.

The public schools receive much more attention than formerly, and the condition of the schools is improving a little from year to year. (See table.)

CAPE GIRARDEAU COUNTY.

This county, organized March 5, 1849, is situated on the western bank of the Mississippi river, one hundred and twenty miles below St. Louis.

The surface of the county may be divided into bottom (level) and upland (rolling and hilly.) It is the southern part, which contains the so-called "swamp lands," estimated at 150,000 to 175,000 acres. The uplands are rolling, and in many places hilly. These swamps will become famed for their fertility; they are easily reclaimed by draining. Along the river and creeks are also fertile bottoms, producing grains and grasses in great abundance; the most of the uplands are excellent for the production of wheat, corn, oats, clover, etc., principally the former, as this county has long been known to produce wheat of the finest quality.

The county is well watered by many rivers, creeks and springs, some of the larger creeks affording many sites for mills or manufactories.

Timber is abundant and sufficient to prove adequate to the future demand for railroad ties, fences, building purposes, and for fuel.

Some iron has been found, but no mines have been opened, and it is not known whether it exists in sufficient quantities to render the working of it remunerative. Fine marble exists in large quantities. Also, fine sand for glass and clay for manufacturing earthenware.

The climate is mild and healthy.

The county contains the following manufactories: 8 steam-flouring-mills, 7 water flouring-mills; 10 steam-saw-mills; 3 woolen factories; one foundry; two lime kilns; one soda water factory; one large distillery; one washing-machine factory, and 2 paint mills. The yellow ochre employed by the last is found in the county. There are also a large number of cooper shops connected with the flouring-mills.

According to the census of 1870, there were 99,131 acres of improved land; 178,619 acres of woodland, besides 331 acres of other unimproved land. The bottom lands and the poplar ridges are held at from $10 to $30 per acre for improved land, and from $4 to $15 per acre for woodland. But few sales are made, and where sales are forced, the prices are very apt to fall below the amounts named. The prices of land have decreased since the war—owing to many reasons, such as the cheaper lands further west, scarcity of money and no immigration.

The number of inhabitants is 17,558.

Agriculture is the leading occupation.

Hogs, neat cattle, horses, mules and sheep, are raised to a considerable extent for sale.

The crops of 1874, with the exception of wheat, did not reach one-half of an average yield, being caused by the severe drouth and the ravages of the Chinch Bug. The yield of 1874 is about as follows: Corn, 20 bushels; wheat, 20 bushels; barley 35 bushels; oats, 15 bushels; rye, 15 bushels; Irish potatoes, 50 bushels; sweet potatoes, 100 bushels; red top, timothy and clover ¾ to 1 ton per acre. Other cereals and fruit are raised to a limited extent for home consumption.

Blue grass grows spontaneously, but neither that nor any other tame grass is used to any extent for pasture, unless it be the meadow after the grass is cut. Clover is principally relied on for pasture, and is highly esteemed. The wild grass of the woods furnishes nourishment for stock, which are allowed to run loose from April to November.

Some attention has been paid to improving the breed of the different animals, and the success is visible in the appearance of the stock. Sheep-rearing is profitable, and could be made more so by giving greater attention to improved breeds and protecting them from the worthless curs.

A large majority of farmers are opposed to a stock law.

Rail fences are universally used for fencing, there being plenty of timber for that purpose, and probably for generations to come.

Orchards are planted to some extent, and, with proper care, succeed well. Peaches do admirably, and yield rich returns. About 125 acres are planted in grapes, and wine of good quality is made, meeting with a ready sale, so that the quantity raised does not supply the demand.

The Mississippi river furnishes the principal facility for market, and it is a very good one, forming the eastern boundary line of the county, a distance of about thirty miles. The I. M. R. R. passes through its western part, but on account of high rates is not much used, farmers preferring to haul their produce fifteen to twenty miles to the river. St. Louis, Memphis, New Orleans and Mobile are the principal markets.

The county is well supplied with good public schools, (see table) and the people are determined to make the system a success. The city of Cape Girardeau has excellent graded, private and other schools, as well as the State Normal School for Southeast Missouri.

CARROLL COUNTY.

Carroll county, organized January 3, 1833, is situated on the north bank of the Missouri river, distant from St. Louis, by the river, 320 miles, and by St. Louis, Kansas City and Northern Railroad, 200 miles, its eastern boundary being Grand river. About one-fourth of its area is in the Missouri river bottom, a nearly level surface of rich alluvial soil; the remaining three-fourths is undulating prairie, with dark loamy soil, usually very rich and productive, with frequent belts of timber following the course of the various streams. These streams afford an abundance of stock water, and some very good mill-sites on some of them. About one-fourth of the county is covered with timber; the oaks, hickory, elm, hackberry, walnut, sycamore, maple, locust, etc., prevailing, offering sufficient timber for all purposes. Coal is found in nearly every portion of the county, and is mined on a small scale in five different and widely separated localities, employing about 25 operatives. The county enjoys a healthy climate. In 1870 (census), there were in Carroll county 130,418 acres of improved land; 74,669 acres of woodland, and 89,662 acres of other unimproved land. The price of improved lands varies from $15 to $40 per acre, according to situation, improvements, etc., and unimproved lands from $8 to $20 per acre. Timberland sells from $8 to $30 per acre. Land advanced in price rapidly from 1866 to 1870, since which time it has gradually declined in value. There are eight flouring-mills; one woolen factory; one foundry; one plow factory, and one tobacco factory in Carroll county. Agriculture is the leading pursuit of the 17,446 inhabitants (census 1870).

The principal productions are corn, wheat, oats, hogs, cattle, horses, mules and tobacco. Exports are mostly wheat, oats, fat hogs and cattle, some horses, mules and tobacco. Owing to drouth and chinch bugs, the crops of 1874 are lighter than those o former years, which are about, of corn 8 barrels per acre; wheat, 18 bushels; oats, 30 bushels; potatoes 60 to 100 bushels; hay one and a half to two tons, and of tobacco 1000 pounds, per acre. Rye, hemp, flax, castor beans, broom corn, sorghum, sweet potatoes and navy beans are raised with fair success for home consumption. Blue grass, timothy and clover are used to a limited extent for pasturage, the former seeming to be natural to the soil.

The stock of this county is gradually increasing in quality, since farmers have come to the conclusion that improved stock pays best. Quite a number of good breeds of all kinds of stock have been introduced. Sheep-raising is profitable when properly managed, but as most of the sheep owners allow their flocks to run at large "on the range," the dogs have their forage. There is no serious loss among sheep from disease, and the county is well adapted to its husbandry. The stock law was submitted to the people, but defeated. Worm, post and rail, or "slat fences," also plank fence and hedges of Osage orange are in use, and in nearly equal proportion; the latter succeeds well with proper care.

Orchards grow well, and the apple crop is generally excellent. There are but few engaged in grape-culture on an extensive scale, but every enterprising farmer in the county has some grapes.

St. Louis is the principal market for all the productions of Carroll county, and the facilities for transportation are ample, viz: the St. Louis, Kansas City and Northern Railroad, running the entire length of the county, east and west, and the Missouri river forming the entire southern boundary of the county. From the close of the war, for five years, the influx of immigration was rapid, probably amounting to ten thousand, from all sections of the county, and an excellent class of citizens, a majority of whom belong to the farming class.

The public schools (see table), are in a flourishing condition, and the people are alive to their educational interests.

CARTER COUNTY.

Carter county is situated in the southeast part of Missouri, and was organized March 10, 1859. The surface is very broken, with fine bottom land along the water courses, and some very fertile valleys. The greatest part of the county is covered with a heavy growth of timber, not more than about one-fortieth of the original growth having been cleared off, so that timber is very abundant and likely to remain in that state for many years to come. Heavy pine forests cover the hills, while large trees of different kinds, such as oaks, hickory, black walnut, honey locust, birch, maple, etc. abound in the bottoms. The soil in the bottoms and valleys is rich and very fertile; many of the hills are too steep and rugged to be susceptible of cultivation.

The county is well watered by many large and small rivers and creeks, the most important of which is the Current river, furnishing excellent sites for machinery. The cliffs along these swift and clear streams are very steep, affording many a "rugged edge" to seat upon and catch trout, salmon and various other kinds of fish abounding in quantities.

At present the mineral resources are wholly undeveloped; traces of lead and copper are found, and iron exists in large quantities, but is not yet mined.

Of manufacturing establishments very little can be said, besides 3 saw and grist mills, two of which are moved by water-power, there are none.

The census of 1870 gives 6,191 acres of improved land; 34,063 acres of woodland, and 188 acres of other unimproved land. The price of improved land is about $8 per acre, and of unimproved land, including the hills, ranges from $1 to $5 per acre. The number of the agricultural inhabitants is 1,455 (census 1870).

The leading agricultural staples, named in the order of their importance, are corn, wheat, oats and rye. Wheat is exported to a considerable extent, while the surplus corn is fed to cattle and hogs, which are shipped to St. Louis on the Iron Mountain Railroad. Considerable pine lumber is rafted on Current river, and finds a ready sale in Arkansas.

The only commercial crops cultivated for market are tobacco and cotton.

Comparatively little attention has been paid to stock-raising, and few, if any, improved breeds of stock have been introduced.

Fruits of all kinds, including grapes, grow very well, but only few orchards of any size have been planted as yet. Many of the hillsides, considered quite worthless but for the timber, can be well utilized for the cultivation of the grape.

But little favorable can be said about the public schools; but people are commencing to see the advantages of the system. (See the table for statistics of schools.)

CASS COUNTY.

This county, situated in the western part of the State, was organized September 14, 1835. Its surface is a rolling prairie, moderately supplied with timber of varied qualities, skirting the streams and creeks.

Grand river and Big creek, with their numerous tributaries, furnish an abundance of stock water; their water-power is but of little value.

The soil is principally a black loam, except on ridges, where a soil known as "mulatto" is found. The climate is remarkably healthy. About one-fourth of the county is timberland, and in the absence of wastefulness, the natural growth will keep pace with the demand for fuel, fencing, etc. From 1866 to 1870, the opening and improving of farms caused a consumption of timber greater than the natural growth. Heretofore operations for coal have been confined to surface diggings, in which an excellent quality of bituminous coal is obtained in moderate quantities. No organized effort has as yet been made, and but little money or labor expended, for the development of the mineral resources of Cass county. There are 176,135 acres of improved land; 62,337 acres of woodland, and 69,914 acres of other unimproved land in this county. The average price of improved farms is about $25 per acre; of unimproved lands, $12, and of timberland, $25 per acre. After the war, the prices of land advanced rapidly for about four years, but since that time it has declined from 30 to 50 per cent. from the highest value reached. This decline is caused by many reasons—excessive taxation for railroads, failure of crops, and cessation of immigration. There are nine flouring-mills, one woolen factory and two carding machines in Cass county. All the improved labor-saving implements have been introduced. None are manufactured there.

The county had, in 1870, 19,296 inhabitants, mostly an agricultural population.

Corn, wheat, oats, hogs, cattle, horses and mules, are the principal agricultural staples; wheat, corn, oats and neat cattle are the articles for export.

The average yield of crops for 1874 is so small on account of drouth and Chinch Bug, that it is difficult to make an estimate, the crops ranging from one-half of an average to an entire failure. All the other cereals and fruits are grown successfully for home consumption. On account of the ravages of the Chinch Bug, the farmers are turning their attention to the raising of flax for seed. Blue grass is indigenous to the timber and prairie lands, and affords excellent pastures. Clover and timothy flourish, except in extreme dry seasons, and if the latter was extensively grown, would be a profitable commodity for export.

Improved breeds of cattle and hogs have been introduced, to a limited extent, and with gratifying success. Sheep husbandry, if properly conducted, would certainly be profitable. They are healthy, and comparatively little is heard of depredations by dogs. A stock law is wanted by land holders on the prairie, but is opposed by farmers near the timber, by "renters" and people living in the little towns. The question of restraining swine was submitted to the people, but was voted down.

The fences in use are slat, post, rail and plank fences. The Osage orange is grown successfully as a hedge, growing vigorously in the deep, rich soil.

The people are successful in raising fruits of almost all varieties. Grape vines are cultivated on a small scale by almost every farmer, for home consumption.

The facilities for markets are good, being the M. K. & T. R. R. (Osage division), and the M. P. R. R.

Cass county being in the depopulated district, has been settled up altogether since the war, only a very small proportion being old residents. The immigrants are mostly from Illinois and Iowa. The population, for the most part, are industrious, intelligent and enterprising citizens.

Pleasant Hill and Harrisonville have each large buildings for high schools, and the county is well supplied with public schools and good teachers.

CEDAR COUNTY.

Cedar county, situated in the southwestern part of the State, was organized from parts of Dade and St. Clair in 1843. Its surface is rolling, about half timber and half prairie. About one-half of the land is tillable, ranking in quality from first rate to third rate.

The county is well watered by several rivers and streams, affording abundance of stock water. The principal water course is Sac river, which is a good mill stream, running east of the center of the county from south to north.

Timber is plentiful for building, fencing and fuel, and also for railroad ties, if the fires are kept out of it.

Coal, superior for smithing and forging, as well as for fuel, is found in large quantities in the western part of the county, and is sold on the banks from 10 to 12 cents per bushel; it is mined in the northeast part. There are favorable indications of other minerals, such as iron, lead, zinc and antimony. Building stone of a fair quality is also found.

The climate is mild and healthful, not subject to long winters or extreme cold.

There are (1870) 35,678 acres of improved land; 84,809 acres of woodland, and 20,546 acres of other unimproved land. The average of improved land is about $20 per acre; of bottom land and upland, or prairie land, about $12 per acre; unimproved timberland can be bought for $8, and prairie land for $5 per acre. The prices of land had advanced since the war about one-half, but are now rather on the decline.

Cedar county has three flouring-mills, but no other manufacturing establishments.

Agriculture is the leading occupation for the 9,474 inhabitants, (census 1870.)

The principal productions are wheat, corn, oats and hay. Wheat is the article for export, and the yield of it this year will compare favorably with previous years; corn will not come more than one-third up to its average, and oats not more than one-half. The average yield of wheat was 17 bushels; corn, 10 bushels, oats about the same as wheat, and hay about two tons per acre. Tobacco is grown as a commercial crop, but not to any great extent, though succeeding very well. Other grains, all doing well, are cultivated on a smaller scale, and only for home consumption. Considerable attention has lately beeen paid to the cultivation of flax, which grows well and is not attacked by the terrible foe of the farmer, the Chinch Bug.

Blue grass has been tried, and seems to have found in Cedar county a natural home; clover also succeeds well. The county offers great inducements for stock raising, having an abundance of fine, natural pastures, with plenty of stock water and mild winters, and this branch of agriculture is fast increasing in importance.

A stock law is not wanted by a majority of the citizens.

The rail fence is almost exclusively used; hedges have been tried and proved successful with proper care and management.

Fruit of all kinds, adapted to this latitude, do well and the area of orchards is fast increasing. Viticulture is but in its infancy.

The market facilities are the M. K. & T. R. R.; Schell City is the nearest point, about thirty miles from the county seat. St. Louis is the principal market in the east, and Nevada and Fort Scott in the west.

This county has received its portion of the immigration since the war; about one-half of its present inhabitants have settled there since that time. They are mostly ot the laboring class, and a thorough go-a-head kind of people.

The educational interests are well attended to,(see table) and much interest is taken by the citizens to have good school houses and able teachers.

CHARITON COUNTY.

This county is situated in the northwest central part of the State; is bounded on the south by the Missouri river, and on the west by the Grand river, and was organized November 14, 1820. The general surface of the county consists of upland prairies and timberland, which form a broad belt on both sides of the watercourses. The rich alluvial bottom land of the Missouri river are well known for its fertility, and similar bottoms are found on the Grand and Chariton rivers and their branches. In the northern part of the county the land is high, with a rich, productive loam. The county has about as much timber as is needed for fencing, building, fuel, etc.

The only mineral as yet discovered is bituminous coal; it is found in many places, cropping out on the slopes, where it is used by farmers. There is only one mine worked at present, with an average thickness of three feet, furnishing about 7½ feet thickness of coal within the space of about 50 feet. Clay for fire-brick and potterry is also found.

The manufacturing establishments embrace three flouring-mills, and several grist mills, and about twelve tobacco factories. Plows, harrows, etc., are made on a small scale.

The county had, in 1870, 118,952 acres of improved land; 98,045 acres of woodland, besides 37,746 acres of other unimproved land. The average price of improved land is from $15 to $20 per acre, and of unimproved land from $5 to $10 per acre. The leading occupation of the 19,186 inhabitants (census 1870), is agriculture. The principal agricultural staples are tobacco, wheat, corn, oats, hay and fruit. The commodities for export are tobacco, wheat, corn, cattle, hogs, mules and horses. The county is extremely well adapted to the growth of tobacco of fair quality, and a very great amount of it is raised annually.

Considerable attention has been paid to stock-raising, and improved breeds of all kinds have been successfully introduced

Blue grass and prairie grass furnish the pasturage; the former is rapidly taking the place of the latter, on account of the extended wild ranges.

A stock law is not wanted by a majority of the population.

The soil and climate is well adapted to the growth of all kinds of fruits, and of late many fine and promising orchards have been planted.

The county is well supplied with facilities for transportation, having 24 miles of track of the Omaha Branch; 28 miles of track of the main track of the St. Louis, Kansas City and Northern Railroad, and 11 miles of track of the K. & K. C. R. R.

A considerable influx of immigration, chiefly industrious farmers from the northern and eastern States, have settled in this county since the war.

The county has good school houses, furnished well, and also quite a number of excellent teachers. (See table).

CHRISTIAN COUNTY.

Christian county is situated in the southern part of the State. It was organized March 8, 1860. The county is situated on the south descent of the Ozark Mountains. The surface of the county is undulating, hilly and broken in the south-eastern portion, which is the principal mineral district. The western, central and southwestern portions are prairies, with a small sprinkling of bottom lands. These latter parts of the county form the agricultural districts, and are about equally divided between prairie and upland.

The county is well watered by many fine creeks, flowing mostly in a southerly direction, by numerous rivulets and lasting springs, furnishing the purest of water for all domestic uses and for stock. The country along these streams is heavily timbered with the various kinds of trees growing in southern Missouri.

The soil of the valleys and of the upland, wherever tillable, is excellent. The climate of this county is very mild and salubrious.

Timber is abundant for all practical purposes, and for years to come, about two-thirds of the county being formerly covered with timber.

The mineral resources of the county are only partially developed. Lead is found in great abundance, and the mining of it was carried to a considerable extent before the war. Only money and enterprise is needed to establish the fact that this county is a very rich lead district. At present little mining is going on, and there is only one smelting furnace in operation. Rich deposits of iron and tripoli have also been discovered. The manufacturing interest is confined to a few flouring, saw and grist-mills, and two tobacco factories.

The county had, in 1870, 32,738 acres of improved land; 1,061 acres of woodland, and 84,394 acres of other unimproved land. The Atlantic and Pacific Railroad owns about 50,000 acres of land, mostly good agricultural land, which is for sale from $2 to $12 per acre. The price of improved land ranges from $5 to $20 per acre; of unimproved bottom or prairie land, from $6 to $10 per acre, and of upland barrens, frequently hilly and stony, from $2 to $5 per acre. There is also some government land situated in the county, mostly hilly land.

The leading occupation of the 6,707 inhabitants (census 1870), is agriculture.

Wheat, corn, oats, tobacco, live stock and fruits are the chief products, yielding all a very fair average crop. Tobacco of very good quality is grown extensively, yielding about 1000 pounds to the acre; vegetables and cereals are only grown for domestic use. There being plenty of wild pasturage for summer grazing, but little tame grass is grown, and chiefly timothy.

Considerable numbers of neat cattle, horses, mules, hogs and sheep are raised for market, and improved breeds have been successfully introduced. A stock law is not wanted.

The soil and climate are well adapted to fruit-culture, and much attention is given to the cultivation of apples of very fine quality. Grapes are cultivated successfully to a limited extent.

The only means of transportation to market is furnished by the A. & P. Railroad, which has seven miles of track in the northwestern part of the county. The principal market for the surplus produce and stock is Springfield and St. Louis.

There has been a great influx of population since the war. In 1865 the county was nearly depopulated.

A lively interest is manifested by the citizens in educational matters, and the county is well supplied with public schools. (See table).

CLARKE COUNTY.

This county, organized December 16, 1836, is the most northeastern county in the State, being bounded on the north by Iowa, and on the east by Illinois, separated by the Mississippi from the latter State. The surface is undulating, generally somewhat hilly next to the creek and river bottom. The greatest part of the county is capable of being tilled, having a rich, friable loam on a clay subsoil. Timber is still abundant, and mostly so along the streams and the hill lands next to the bottoms; it is well distributed for farm uses.

The county is well drained by many rivers and creeks, affording an abundance of water for stock. The Des Moines river, which forms a portion of the northern boundary line of this county, offers a great amount of water-power; water-power is also found on the north and south branches of Fox river.

Coal has been found in the northeastern part of the county, and mines are worked in several places. Some veins of iron ore have also been discovered. Good sand and limestone for building purposes are found in many places of the county. The county has a fine and healthy climate.

The census of 1870 gives 100,697 acres of improved land; 71,642 acres of woodland, and 33,691 acres of other unimproved land. The prices of land have declined during the last year; improved land sells at present from $10 to $40 per acre, according to improvements and situation. One of the causes of the decline is a heavy railroad tax.

There are, according to the census of 1870, 13,667 inhabitants in Clark county. The leading occupation of them is agriculture, there being few manufacturing establishments, consisting of a few flouring-mills; one woolen-mill; one foundry, and several wagon shops.

The principal agricultural product is corn, though wheat, rye and oats are also raised to a considerable extent. The corn and wheat crop of 1874 was very good, but would have been still better had the Chinch Bug been less numerous. The average yield of corn is 40 bushels; of potatoes, 100 bushels; of wheat, 18 bushels; of hay, one ton; and of oats not over 25 bushels per acre.

Beef cattle, hogs, corn, oats and wheat are exported to some extent. Rye is grown to some extent; but barley, hemp, flax, castor beans, broom corn, sorghum, etc., doing very well, but are raised only for home consumption.

Blue grass does remarkably well, and is extensively used as pasturage. Clover and timothy are also used for that purpose.

Stock-raising is one of the leading pursuits of the farmers, who aim to make their money by raising and selling stock. Much attention has been paid to the introduction of better breeds of cattle, hogs and sheep, with marked success. Dogs do considerable damage to the sheep, not making the raising of them very profitable.

A stock law would be acceptable to a large number of the citizens.

Osage orange hedges do well, and are raised a good deal. Most every farmer has an orchard, and much interest is taken in fruit-culture; all the fruits adapted to the latitude of Clark county succeed well. Grapes are raised to a very small extent for home use.

The county has excellent facilities for markets, which are St. Louis and Chicago. Besides the Mississippi river, there are the Texas and Northern Railroad and the Missouri Valley and Western Railroad.

A comparison of the schools of the past five years, shows an immense progress in everything pertaining to public schools, thus demonstrating the efficiency of the common school system; beside these public schools (see table), there is a college at Alexandria and several private schools of a high grade.

CLAY COUNTY.

This county is situated in the northwestern part of the State, on the north side of the Missouri river, which forms its southern boundary, and was organized January 2, 1822. Except some broken ridges near the large streams, the surface of Clay county is generally rolling or undulating. A little over three-fourths of its surface was originally timbered land.

The soil on the ridges along the rivers is a light mulatto clay; the rest is a very deep, black and fertile loam. The productive Missouri river bottoms are, on an average, about one and a half miles wide, but those on the other streams are quite narrow.

Many rivers and creeks meander in different directions through the county, affording abundance of stock water.

Coal is the only mineral known, and that is but little worked, if at all.

The climate is healthy and not very variable.

The census of 1870 gives 159,896 acres of improved land; 40,361 acres of woodland, besides 4,103 acres of other unimproved land. The prices of land vary considerable, according to locality and improvement, but are now quite low, there having been a material decline during the last three or four years, partly owing to the general stagnation in business and the scarcity of money.

The county had, according to the census of 1870, 15,564 inhabitants, which are mostly employed with agriculture, there being but few factories in the county.

There are several respectable flouring-mills, and three woolen-mills, in successful operation, and one or two wagon and plow factories.

The leading agricultural staples are corn, wheat, oats, pork and cattle; the latter two being all that is exported to any extent.

The average yield in 1874 is considerably below the usual yield: it was of corn, about 25 bushels; of wheat 13 to 15 bushels; of oats, 25 to 29 bushels, per acre. Other cereals and fruit are successfully grown to a limited extent for home use.

Blue grass seems to be native to this county, and is extensively grown, principally for winter pasture. Clover is also raised extensively, as well as timothy, which latter yielded in 1873 (exceeding the average) 3,000 pounds per acre.

Considerable attention has been paid by many farmers to the importation of improved breeds of stock, and some fine herds of them are now in Clay county. Sheep-raising could be made profitable, if fewer yellow curs were fed on mutton.

A stock law seems not to be wanted by any considerable number of farmers. It was once submitted to a vote, but was defeated.

Orchards have been of late years planted to some extent, and with good success. The interest in fruit-growing is rapidly increasing. All the fruit adapted to this latitude are grown successfully, and of a superior quality. Grapes do well, and about 80 acres are planted with vines, chiefly with Concord.

Kansas City is the market for the western part of the county; Chicago and St. Louis receiving the live stock. The facilities for shipping are the Missouri river and four railroads.

The county has many good public schools, with able teachers, (see table,) and also the William Jewell College, at Liberty.

CLINTON COUNTY.

Clinton county, organized February 12, 1841, is the second county north from the Missouri river, adjoining Clay county on the north. It is well diversified with timber and prairie. Its surface is gently undulating or rolling, neither abruptly hilly nor monotonously level, just sufficiently rolling to be naturally well drained, and contains some of the most fertile soil in the State.

This county has no large rivers, but is well watered by several small streams, which, however, furnish but little available water-power.

Timber is abundant for all purposes, and in many places there is a fine growth of young timber, which will no doubt supply the future demands, except perhaps for railroad ties.

Coal is supposed to exist in large quantities, but as yet no mines have been opened. The climate is very healthy.

The census of 1870 gives 131,446 acres of improved land; 44,004 acres of woodland; besides 25,040 acres of other unimproved land. The average price of improved farms is about $20 per acre; of unimproved land, about $10 per acre; varying but little, whether prairie, timber or bottom land. The price of land increased from 1865 to 1870, but has returned again to about 50 per cent above what it was in 1864. The reasons for the decline are obviously the cessation of immigration, the stringency of money matters, coupled with poor crops in 1873, and almost a failure in 1864, there being very ittle raised in these three years for export.

There are eight flouring-mills; three cheese factories; one woolen factory, and three wagon and plow factories, and all in successful operation.

The county has an agricultural population, the census of 1870 giving 14,063 inhabitants.

Corn, wheat, oats, rye, barley, hay and potatoes are the principal agricultural staples. The exports are chiefly stock, such as cattle, mules, hogs and sheep, with wheat and oats, the corn being mostly used to feed the stock. With the exception of oats, which averaged 32 bushels per acre, the crops were almost a failure. The usual yield of corn is 40 bushels; wheat, 15 bushels; oats, 45 bushels; hay, 2 tons, per acre. In favorable seasons, the husbandman is always rewarded with as bountiful crops in this county as in any part of the great west. The commercial crops yield also, usually, a full crop. Tobacco is grown in small quantities, but will receive more attention before long.

Blue grass is at home, and does as good as in the famed blue grass region of Kentucky. Clinton county is a stock county; the products of her rich and prolific soil are disposed of in the shape of fat cattle, hogs, mules and sheep. Much attention has been paid to the improved breeds, such as short-horned cattle, cotswold sheep, berkshire, poland-china and chester-white hogs, which give entire satisfaction. Sheep-raising is profitable for wool and mutton, but some injury is done by dogs and wolves. A stock law seems to be not wanted by a majority of the inhabitants.

Rail, plank and corduroy slat fences are chiefly used; hedges are quite numerous, and succeed well when properly attended to.

Fruit-growing may be said to be a success wherever the orchards have come into bearing, but the efforts to establish young orchards in the past few years has been somewhat discouraging on account of the borer. Viticulture is yet in its infancy.

The facilities for transportation of the products to market are unsurpassed by any county in the State, there being four railroads passing through the county, two of them passing through the county seat. Chicago, St. Louis, Kansas City and St. Joseph are the principal markets.

There was quite an influx of immigration into this county after the close of the war, principally from Ohio, Illinois, Pennsylvania and further east, being a better class of small farmers. Immigration has almost ceased within the last three years.

The schools in this county are in a flourishing condition, with able teachers, and the interest in the cause of education is still increasing. (See table.) There are fine school buildings at Cameron, Lathrop and Plattsburg.

COLE COUNTY.

Cole county is situated in the centre of the State, and in it is located Jefferson City, the seat of government. The county was organized November 16, 1820.

The Missouri river forms the northern boundary line, and on the east flows the beautiful Osage; both rivers are navigable. These rivers, with their many tributaries, furnish an abundance of farm and stock water. There is excellent water-power on several of its rivers. Should the Osage river be locked and dammed, as contemplated by Congress, it will rival New England in water-power.

The surface of Cole county is high and rolling, covered with a forest of a great variety of timber, such as oak, hickory, ash, mulberry, etc., while the rich bottom lands contain dense groves of walnut, elm, maple, hackberry, sycamore, cottonwood, etc.

The soil is diversified, the upland being of a light, lively mulatto soil, underlaid with a good clay subsoil, producing almost anything intrusted to its germinating and propagating influence. The bottom lands are generally of a rich sandy loam, and very productive. Timber is abundant, there being no prairies in the county.

The mineral resources of Cole county appear to be inexhaustible, especially lead and coal. There are at present 15 lead mines in successful operation, with several furnaces in full blast. Only 5 or 6 banks of coal are being operated at present with good success. The climate is salubrious, but somewhat variable.

The census of 1870 gives 32,642 acres of improved land; 580 acres of unimproved land, and 73,088 acres of woodland. The price of improved farms is from $10 to $25 per acre; of unimproved, from $5 to $10 per acre, and of well timbered land, $15 to $20 per acre. Land was much higher at the close of the war than now, owing to the greater influx of immigration at that time.

Eight steam flouring-mills, one of which is a manufacturing mill; one foundry and machine shop; several wagon manufactories and three wool-carding machines are in Cole county. There is also one pork packing house on an extensive scale. The population, mostly an agricultural one, was, in 1870, 10,292.

The principal agricultural staples are wheat, corn, oats, rye, barley, hay, tobacco, hemp, flax, buckwheat, Irish and sweet potatoes. The average yield of corn is 35 bushels per acre; of wheat, 12½ to 15 bushels, and of potatoes 100 to 150 bushels. The crop of 1874 is not an average crop by 50 per cent., owing to bugs and drouth. The chief exports are corn, flour, bacon, lard, wheat, tobacco and live stock.

Excellent tobacco is grown on the uplands, equal in quality to the famous James river tobacco; it has been raised on some of the thinnest soil in the county, and commanding as high a price as $100 per hundred pounds. The growth of tobacco had, to some degree, been abandoned, but the indications at the present are, that a much larger crop will be attempted this season.

Blue grass, clover and timothy are used considerably for pasturage, but not as much as could be desired, or there would be a greater inclination to improve the different breeds of stock, although of late much more attention has been paid to the introduction of them than formerly, and with gratifying success.

The county is well adapted to sheep-raising, and with proper attention it is very profitable. There is no stock law in the county, and few are prepared for it or desire it. The fences are mostly of rail, there being an abundance of timber. Osage orange has been used by a few farmers, and with good success.

Orchards succeed well when properly attended to. Pears, apples, peaches, cherries, plums, etc., do well, and mature to perfection. The quality of fruit is also excellent. About 100 acres are planted in grape vines, from which thousands of gallons of good wine are made annually.

St. Louis is the principal market, though live stock is shipped to some extent to Chicago and the south. The facilities of transportation are good; besides the navigable rivers, there is the Mo. P. R. R., running through the northern portion of the county, while Jefferson City is the terminus of the L. D. C. & S. W. R. R., thus affording a choice of rail or river to St. Louis and Chicago.

The influx of immigration to this county was considerable for some years after the war, but owing to financial pressure, has to some extent abated. The majority of immigrants are from Ohio, Indiana, Kentucky and Tennessee, and are a good, substantial class of citizens.

The county is well supplied with school houses; but they are, in some districts, poor, and also poorly furnished; but of late, a good many have been fixed up comfortably. (See table.)

COOPER COUNTY.

This county was organized December 17, 1818; it is situated in the central part of the State, immediately south of the Missouri river, thus having a very large river front.

The land contiguous to the river and creeks is somewhat broken, and is covered with a growth of oak, ash, walnut, hickory and elm, but nearly all of the land is susceptible of cultivation, producing very fine wheat, and is also well adapted to the growth of tobacco.

The southwestern and central parts of the county consist of undulating prairie lands, that are unsurpassed for corn and grass.

The soil of Cooper county is ranked among the richest.

Its rivers are very numerous and equally dispersed, furnishing all the necessery stock water and great water-power.

Timber is still abundant, and adequate to all reasonable future wants, as the growth fully keeps pace with the consumption of it.

Coal and lead are the only minerals yet found in sufficient quantities to justify working.

Lead mining is still in its infancy, though there are two mines in the northern part of the county that employ quite a number of operatives.

Coal is found in abundance, but only enough is taken out to supply the local demand.

Potter and fire-clay abound.

The census of 1870, gives 156,334 acres of improved land; 145,123 acres of wood land, besides 5,618 acres of other unimproved land. Improved lands rate from $15 to $30 per acre; and unimproved, $5 per acre.

Immediately after the war, and for several years, lands in cooper county advanced in price very rapidly, and with the decline in price of wheat, have declined as rapidly until this time, and farms can be bought there now, considering the location and facilities for transportation, as cheap or cheaper than in any other county.

The county had, in 1870, a population of 20,692 inhabitants.

There are eight or ten flouring-mills; one woolen factory; one foundry; one furniture manufactory; two earthenware factories, and several cheese factories.

The leading pursuits of our population is agriculture. Corn, wheat, oats, hay tobacco, and potatoes, are the leading productions; wheat is exported to some extent, but the corn is fed to stock and then sent to market.

The corn crop of 1874 was almost an entire failure; the wheat crop, better than an average; oats, not more than a half crop; and hay, very good.

The estimated average yield of wheat, is 40 bushels; of corn, 35 bushels; and of oats, 20 bushels, per acre. Tobacco is cultivated successfully, yet not to such an extent as formerly. All the other cereals and fruits are raised, but only for home consumption. Blue grass is very extensively raised, and with great success.

Great improvements have been made in hogs by the introduction of Berkshire and Poland China breeds.

The cattle are generally of good stock; we have some of the best blooded stock in the State.

Sheep-raising is profitable, and would be engaged in more extensively, were it not for the great number of dogs.

A stock law is desired by the farmers in certain localities, but in others, where there is still some range, it would be opposed.

Rail and hedge fences are used; the former in the timber districts, and the latter on the prairies. The Osage orange grows well, with proper care.

Fruit-growers have been very successful, and many orchards are being planted annually.

The county is well adapted to the culture of grapes, and vineyards are quite numerous; the wine finds a ready sale.

The facilities for transportation are, the M. K. & T. R. R.; the branch of the P. R. R., and the Missouri river. St. Louis and Chicago, are the principal markets.

There has been very little immigration since the war, the greater part of that has been from Germany.

Besides several good private schools and colleges, the county has numerous public schools.

CRAWFORD COUNTY.

This county, organized the 23d of January, 1829, is situated about 80 miles southwest of St. Louis. Its surface is generally rolling, mostly timbered, and with but little prairie. The Meramec river traverses the county from southwest to northeast, furnishing immense water-power. Good bottom land is found along this river and its tributaries. The soil of the lowlands is a rich, black loam, and of the uplands, a yellow clay, particularly well adapted to the growing of wheat.

There is abundant timber, mainly oaks and hickory for fencing, railroad ties, building, fuel, etc.

Most of the uplands was formerly prairie, but since it has been settled and the annual fires stopped from burning over the land, timber has grown up very rapidly, and is now fast on the increase.

Coal is found in small quantities.

Iron and lead are the chief minerals, and are found in great quantities.

There is, as yet, no lead furnace in the county, although several extensive mines are worked; the ore is shipped to other points for smelting.

The Scotia iron furnace, with a capacity of about 30 tons per day, and employing about 500 men, has been in successful operation over two years. They use charcoal, which is made in the vicinity of the furnace. The iron is wagoned to Leesburg, a distance of eight miles, where it is shipped over the A. & P. to different points east. The Midland iron furnace is in process of erection one mile from Steelville, and will be ready for operation about the first of January, 1875. The Iron Ridge, Steelville, Benton Creek, and other ore banks, are being successfully worked, and the ore shipped east. Iron is found in nearly every township and section in this county. Besides the iron furnaces mentioned above, Crawford county cannot boast of any other manufacturing establishments than a number of custom-flouring-mills, and one large merchant-mill.

Agriculture is the leading occupation of the 7,982 inhabitants, (census 1870.) The same census gives 39,543 acres of improved land; 143,794 acres of woodland, and 306 acres of other unimproved land. Improved farms range from $15 to $30 per acre; unimproved land from $3 to $10 per acre. Land has increased considerably in price since the war, and is still increasing.

This county being undoubtedly destined to be one of the leading mineral counties of the State, must necessarily attract much immigration to work the minerals, giving a good home market to the farmers, so that every foot of the productive agricultural lands will be cultivated.

The agricultural staples are corn, wheat and oats. All the cereals and vegetables do well.

Except a few cattle and hogs, little is exported, the surplus finding a ready market at home.

The corn and oats crop of 1874 was not over one-fourth of the average, while wheat was, perhaps, a little above it. The average yield of 1874, was corn, 10 bushels per acre; wheat, 15 bushels per acre; oats, 12 bushels per acre; hay, one ton. Rye, sorghum, sweet potatoes and white beans are grown with perfect success.

No cultivated grass is used for pasturage, the wild grasses being deemed sufficient for cows, sheep and young stock.

Short horn cattle and Berkshire hogs are bred to some extent, with perfect success, and the old native stock will be, in a few years, entirely extinguished.

Crawford county has no extensive fruit-growers; all fruits, however, adapted to this latitude, do well.

Vineyards are a success, and considerable wine is made.

Crawford has good market facilities; what is not consumed by the furnaces, iron and lead mines and the number of small towns, is shipped to St. Louis; mostly wheat, by the St. L., S. & T. R. R., and A. & P. R. R.

The educational interests are receiving increased attention, and most sub-districts have school houses; one private high school is located at Steelville.

DADE COUNTY.

This county, organized January 29, 1841, is situated in the southwestern part of the State. About one-half of it is timber, and the remainder prairie. The eastern part mostly timber, the western mostly prairie. The surface of Dade county is various; the timbered portions hilly, while the prairies are gently rolling, interspersed here and there with belts of timber along the water courses. The soil is mostly mulatto loam white and red clay, mixed with flint rocks, are in some places found near the surface.

The county is well watered by many creeks, which furnish an abundance of stock water; some of them, the Sac river and Turn-back creek, afford water-power.

Timber is getting scarce, at least in the western portion of the county; the young timber grows rapidly, but will not be sufficient for all purposes.

Among the minerals: zinc, coal, lead, iron and copper are found—coal and zinc in abundance. All of the northwestern portion of the county seems to be underlaid with coal of an excellent quality, while the eastern portion seems to be just as well supplied with zinc. Both are being worked extensively.

The county has eight flouring-mills, one woolen factory; three cheese dairies; one wagon factory, and several steam-saw-mills.

The census of 1870 gives 44,885 acres of improved land; 66,095 acres of woodland, and 23,285 acres of other unimproved land. Improved lands average about $15 per acre; unimproved about $5, and timber from $5 to $10 per acre. After the war land increased considerably in price up to 1871; but since that time it has not advanced, if, indeed, it has not declined.

The leading pursuit of the 8,688 inhabitants (census 1870) is agriculture. The principal productions are corn, wheat, oats and castor beans. The exports consist of wheat, cattle, horses, mules, hogs, castor beans, coal, zinc-ore, etc. The crops of 1874 do not compare at all with those of previous years, owing to drouth and chinch bugs. The usual average yield is about: wheat, 15 to 18 bushels; corn, 40 bushels; oats, 30 bushels, and potatoes, 100 bushels, per acre. Tobacco and cotton are grown to a limited extent and yield well; so do the other cereals and fruits, which are cultivated for home consumption.

Blue grass, timothy, and clover succeed well, the former having been tried extensively; it is introducing itself and crowding out the wild grasses.

Improved breeds of cattle and hogs have been successfully introduced. Sheep raising, on a small scale, and with common sheep, is profitable. Dogs in this county do considerable damage.

In the timbered districts, the farmers are not generally in favor of a stock law, while, on the other hand, those on the prairies and the new-comers favor it.

All kinds of fences are in use. To build them is a heavy tax on the new-comer on the prairie, costing him in many cases more than the land. The Osage orange hedge is decidedly a success, and is being extensively planted.

All kinds of fruit do well, and orchards are being planted extensively. Most farmers have a few choice kinds of grape-vines which do well.

The nearest market is Springfield, on the A. & P. R. R., 40 miles from the county seat.

Considerable immigration has come to Dade county since the war, mostly farmers.

Good school buildings have been erected in most of the sub-districts, and competent teachers are employed. (See table.)

DALLAS COUNTY.

Dallas county is situated in the southwest central part of the State; it was organized December 10, 1844. The eastern part of the county is mostly timber and rather hilly, with good uplands. The western part is mostly a gently rolling prairie land, interspersed with water courses, which are belted with timber. The soil on these prairies, which vary in extent from a few hundreds to many thousands of acres, is variable. Some of it is black soil, best adapted to corn, oats and grass, and some mulatto or red land, on which all kinds of grain and vegetables succeed well. The bottom land of the Niangua and its tributaries is very fertile. This river is the principal stream, and affords excellent water-power. Many fine streams, with pure and clear water, and very large springs—one of them discharging 60,000 gallons of water per minute—afford abundant water for farm and stock.

Enough timber is left for all necessary wants.

The only mineral found thus far is lead, which no doubt exists in great quantities. The Rambo mines, twelve miles from Buffalo, are successfully worked.

Except 4 steam-flouring-mills and 10 water-mills, there are no other factories in the county.

The census of 1870 gives 38,991 acres of improved land; 14,323 acres of unimproved land, and 101,638 acres of woodland. On account of the high railroad taxes, very little, if any, land is sold at present, so that it is impossible to give the present average price of land.

Of the 8,383 inhabitants (census 1870) most are employed with agriculture.

The leading staples are corn, wheat and oats, of which wheat is most exported. The average yield of the crops in 1874 is very low, caused by a protracted drouth and the ravages of the Chich Bug. The average of corn crop is only 3 bushels per acre; of wheat, 10 bushels per acre. Tobacco is grown to a small extent, but doing well. Other cereals and fruits are only raised for home consumption.

Timothy, clover and other grasses grow finely, but are very little raised, the farmers depending much on the wild prairie grass for winter feed. With a good natural pasturage, Dallas county is well adapted to stock-raising, and a large number of horses, cattle, sheep and hogs are annually shipped to market. Some few improved stock have been introduced during the last two years. Although dogs do much damage, sheep-rearing is profitable, and could be made much more so.

A stock law is not wanted at present.

There being yet plenty of timber, fences (mostly the worm-fence) are cheap; only few hedges have been planted thus far.

The orchards are generally successful, and much more interest is taken in them than formerly. The grape-vine grows extremely well, but hardly any vineyards have been planted as yet.

The facilities for transportation are not the best, the A. & P. R. R. being the only one running anywhere near Dallas county.

There was very little immigration during the last four years; mostly farmers from Ohio and Indiana.

The report from this county does not speak very favorable for the people of it, which care but little about schools, probably on account of the heavy taxes levied upon them. The county is well supplied with good school houses, and has some very able teachers. (See table.)

DAVIESS COUNTY.

This county, situated in the northwestern part of Missouri, was organized from part of Ray, December 29, 1836. The surface of the county is mostly prairie, with timber along the river and creeks, and some upland prairies interspersed with timber.

The county is drained by the West Fork of Grand river, which passes through it from northwest to southeast, with a wide strip of rich bottom land on either side, heavily timbered with cottonwood, oak, walnut, hickory and hackberry. This river furnishes most of the water-power of the county.

The soil is mostly a black loam, generally less than two feet deep, except in the bottoms, where it is sometimes deeper. The highlands have a black and reddish brown soil, very productive when the seasons are favorable.

The timber is nearly as plenty as ever, but will not prove sufficient for the future demand.

No minerals in sufficient quantities are found to be of any value.

There are a few manufacturing establishments in Daviess county, consisting of six flouring-mills—both steam and water—but not enough to answer the demand; eleven saw-mills; three carding-mills; one washing machine factory, and one for the making of ax-handles. Not enough wagons are manufactured to supply the home demand.

The census of 1870 gives 108,664 acres of improved land; 105,561 acres of woodland, and 57,582 acres of other unimproved land. The price of improved land is about $10 to $12 per acre; of unimproved land, $5 per acre, and of good timber land, $12.50 per acre. The price of land has declined in the last eight years on account of heavy taxes, caused by the county taking stock in railroads.

The county had, in 1870, 14,410 inhabitants—mostly employed in agriculture.

The leading products are corn, wheat, oats, rye and timothy for hay. Fat cattle, hogs and wheat comprise the leading exports; wool is shipped to neighboring counties to be manufactured.

The average yield of the crops in 1874 was estimated as follows: Corn, 20 bushels per acre; wheat, 16 bushels per acre; oats, 30 bushels per acre; hay, 2 tons per acre; potatoes (almost a failure), 40 bushels per acre. The wheat, oats and hay crop is an average crop, but corn only about half a crop. Cotton is not grown, and tobacco in small quantities. Rye, navy beans, sweet potatoes, buckwheat, etc., do well, but are only raised to a limited extent for home consumption. Blue grass and red clover are successfully cultivated to some extent for pasturage.

Of late, considerably more interest has been taken in the improvement of stock, for the raising of which the county is well fitted. Sheep-husbandry is a profitable business in Daviess county, there being no wolves and but comparatively few dogs. A stock law is not yet wanted by a majority of farmers, but many are in favor of a stringent dog law.

Rail or worm fences are chiefly used. Hedges of Osage orange have been tried with but little success, owing to the want of proper care.

The farmers are generally engaged in raising fruit. Apples are grown successfully; peaches with less success. Viticulture is still in its infancy.

The facilities for transportation are furnished by a railroad running through the county from northeast to southwest, bringing the products directly to Chicago. The St. L., C. & V. R. R. runs from the southeast to the northwest across the county, but the rolling stock having been taken off, there is no direct transportation to St. Louis.

The population has increased about one-third since the war, by immigration from the east.

The school houses throughout the county are good, and the one at Gallatin is a fine building. The graded school, consisting of four departments, will compare favorably with any school in the State. (See table.)

DEKALB COUNTY.

DeKalb county, situated in Northwest Missouri, was organized February 25, 1845. Its general surface is high, undulating prairie, interspersed with creeks lined with timber, to about one-sixth of the area of the county. It contains about 10 per cent. bottom land, and a small portion is barren and unproductive. The soil, being a dark loam, is excellent for agricultural and grazing purposes.

The streams of the county are small creeks, not large enough to furnish water power to any considerable extent, but affording sufficient water for farms and stock.

There is sufficient timber, if judiciously used, for fuel, fencing and building purposes for all time to come, but not for railroad ties.

There are no minerals yet found in DeKalb county.

The manufacturing establishments are limited to a few flouring and saw-mills run by steam.

The county contained, in 1870, 84,248 acres of improved land; 41,983 acres of woodland, and 42,756 acres of other unimproved land. Improved farms are worth, on an average, $15 per acre; unimproved lands, from $5 to $8 per acre; good timberland, from $10 to $14 per acre, without regard to locality. Land has shrunk in value since the war. The reasons for shrinkage are various. Many men have bought railroad lands and failed to pay the installments, and another is the scarcity of money. The leading occupation of the 9,858 inhabitants (census 1870) is agriculture.

The leading agricultural productions are corn, wheat, oats, rye, timothy and potatoes. Exports are wheat, oats and rye, but only to a small extent, being mostly fed to stock and shipped in this form. The crops of 1874, with the exception of wheat and oats, are not more than about 50 per cent. of the usual average. Corn did not yield more than about 15 bushels per acre; wheat, 15 bushels per acre; oats, 40 bushels per acre; hay, 2 tons per acre, and potatoes scarcely any. Tobacco and cotton are not grown for market. Barley, rye, flax, sorghum, sweet potatoes, etc., are cultivated for home use, and do well. The cultivated grasses are being introduced for pastures, and do finely. Blue grass is gradually superseding the prairie grass pastures.

Farmers and stock-growers are paying considerable attention to improved breeds of stock; they think it pays. Sheep-raising is a very profitable branch of stock-raising, and would be more so if it was not for the depredations of the dogs. A stock law is, perhaps, desired by about one-fourth of the inhabitants.

The fences most in use are plank, hedge and the old-fashioned worm fence. Timber being rather costly (costing about $1.00 per rod for fencing), Osage orange hedges are being planted, and with marked success.

Fruit-raising is attended with good success, some parts of the county being excellent for that purpose. There are no vineyards, though nearly every farmer has a few vines to furnish grapes for the table.

The facilities for transportation are the H. & St. Joe R. R. and the C., R. I. & S. W. R. R. The northern portion of the county, and in fact Northwest Missouri, is lost to St. Louis because of the failure to build the Brunswick & Omaha Railroad. As it is, the principal market is Chicago.

There was a large influx of immigration just after the close of the late "unpleasantness," principally from Ohio, Indiana and Illinois.

Several of the larger towns have good graded schools, and the public schools throughout the county are in a flourishing condition. (See table.)

DENT COUNTY.

Dent county is situated in the southeast central part of the State, and was organized from parts of Shannon and Crawford counties, December 4, 1855. The surface of the county is very diversified, the Osage mountains passing east and west through it, and forming a table land from 800 to 1000 feet high. The divide descends gradually towards the Missouri, and the streams flowing in that direction are deep, but not near as rapid as those flowing south, which are frequently forming falls.

The Current and Meramec rivers are the principal water courses, and they afford with their numerous larger and smaller affluents, all the necessary water for stock and farm use. The former meanders along the southern border of the county, through a rough and broken land; its flow is very rapid, and affords many excellent sites for water-power, being, perhaps, not excelled by any other stream of similar size in the State.

The eastern and southern tiers of townships are heavily timbered with pine, and the balance of the county with oaks, walnut, hickory, etc.

Only few and small prairies are found within the limits of this county. Many fertile bottom lands are situated along the rivers and creeks. The soil on the uplands is sandy, with clay, and generally productive.

Iron, lead, copper and zinc, make this county rich in mineral wealth. Immense deposits of red hematite and blue specular iron ores of excellent quality are found most everywhere in the Ozark range. Some sixty deposits are known, and others are discovered every little while. Simmonds' mountain, in the vicinity of the county seat, is considered only second in size to Iron mountain, covering about 80 acres, and about 90 feet above the surrounding plateau. This and some other banks are extensively worked, shipping about 500 tons daily.

Besides these mines, two flouring-mills, three lumber mills, a planing mill, and a tobacco factory, comprise the manufacturing interests of this county.

The county contained in 1870, 22,950 acres of improved land; 4,163 acres of woodland, besides 112,539 acres of other improved land. The price of improved land varies from $7.50 to $25 per acre; of unimproved land, of good quality, from $2 to $5; and of timber from $1 to $5 per acre. The pine lands will yet prove a source of great wealth to the county.

In 1870 there were 6,357 inhabitants, whose leading occupation is farming. The leading agricultural productions are wheat, oats, corn, hay and potatoes, producing large average yields. The county is well adapted to the growth of tobacco, and large quantities of a very fair quality are raised annually. Cotton, sweet-potatoes, cereals and vegetables all grow well, and are raised for home consumption.

About 150,000 acres of superior land are yet uncultivated, inviting the farmer in quest of a cheap home, on account of the fine, wild range. Comparatively little attention has been paid to the cultivation of tame grasses, for which the county is eminently adapted. Stock of all kinds are profitably raised, except sheep, for which this is an excellent county; wolves and dogs do much damage.

Orchards and vineyards also do well, but the county being comparatively new, only few have been planted as yet.

The St. L., S. & L. R. R. R., forming a junction at Cuba with the A. & P. R. R., has 15 miles of track in this county, and will probably be extended to the southern border of the State. This railroad furnishes the means for transportation, but the leading market is as yet at home, only the iron ore being exported to any great extent.

Improvements in schools are being made slow but sure, and the character of the public schools throughout the county reflects credit upon the citizens. The Salem Academy is well patronized.

DOUGLAS COUNTY.

Douglas county is situated in the southern part of the State, and was organized October 19, 1857. It is situated on the south side of the Ozark mountains. Its surface is broken and entirely covered with timber, there being no prairie land within its area. The county is drained by several fine streams, which afford excellent sites for machinery of almost any kinds.

The bottom lands on these streams, and their many smaller affluents, is extremely fertile, producing fine crops of corn. The soil on the upland is generally good, and well adapted to the culture of wheat; some of the hills are sterile.

Timber is abundant for years to come, and consists principally of the different kinds of oak, yellow pine, cedar, black walnut, maple, hackberry, ash, and many other species of trees.

The mineral resources of the county are not yet developed; small quantities of iron and lead ores have been found in many parts of the county.

Of manufacturing establishments there are few, as in all new countries, and consist of a few grist and saw-mills, and blacksmith shops.

The county had, in 1870, 12,840 acres of improved land; 228,000 acres of woodland, and 40,184 acres of other unimproved land. About 100,000 acres of the county are cultivated; the remainder is government land. Improved lands value from $5 to $7 per acre, and unimproved lands $1.25 to $1.50 per acre.

The county had, in 1870, a population of 3,915, whose leading occupation is agriculture. Corn, wheat and oats, are the principal staples. Wheat, lumber and cattle are the commodities for export. But little attention has been paid to the culture of tame grass, for the simple reason that there is an abundance of wild grass for pasturage, and for this reason a stock law is not wanted. The hills and valleys are covered with a luxuriant growth of grass for the greatest part of the year, affording an abundance of grazing for cattle and sheep, and good mast for hogs. The winter seasons are short and comparatively mild. But little attention, notwithstanding all the natural advantages for the raising of stock, has been paid to the improvement of better breeds, and as a general thing, the native, or scrub breeds of cattle, can be found here in its full blooded beauty. Hogs are a mixture of different breeds; (the snout ranging from two feet up to the length of that of an alligator.) Horses are somewhat better. Very little attention has as yet been paid to profitable sheep-husbandry, for which the county is well adapted.

The principal fence in use is the worm or rail fence, costing but little to put up on account of the plentiful quantity of timber.

Douglas county is well adapted to the culture of fruits, and a failure seldom occurs; great quantities of apples, pears and peaches are grown every year. Grapes do well, as far as tried, but are as yet little raised, and only for domestic use.

There have been more schools taught last year, and a deeper interest manifested by the people of this county than formerly, and schools are rapidly improving. (See table.)

DUNKLIN COUNTY.

Dunklin county lies directly west of Pemiscot, these two being the extreme southeast corner of the State; the county was organized February 14, 1845. The greatest part of the county is susceptible of cultivation, and is a rich black sandy soil, very productive, being nearly all river bottom. There is but one hill and no rocks in the county. Almost the whole county is covered with timber, there being but two small prairies in it. Little river runs through the southeast corner of the county, and Varner's river through the western part. There are no other rivers or creeks in Dunklin county, but there are a great many sloughs, some running entirely across the county; others, after running several miles and forming large islands, flow back into the St. Francis river, from which they all start. There is no water-power suitable for machinery in the county. The timber is as fine as any in the State, consisting of the different varieties of oak, hickory, black walnut, poplar, cypress, mulberry, black and sweet gum, and various other kinds. There is enough timber to prove adequate to all future demands for many years. Few minerals are found in the county, and no mines are in operation. Bog ore, copperas and coal are found in small quantities, but whether in sufficient quantities to ever make it an object is doubtful.

There are no factories of any kind in the county, and only a few agricultural implements are made for home use.

The county contained (census 1870) 20,997 acres of improved land; 35,742 acres of woodland, and 7,179 acres of other unimproved land. The average price of improved lands is about $10 per acre, and of unimproved lands, from $1 to $4 per acre. The price of land has advanced very little since the war.

The leading occupation of the 5,982 inhabitants (census 1870), is agriculture. The chief productions are corn and cotton. Cotton is almost the only article raised for export. Castor beans are raised to some extent, but cotton has heretofore proved the most remunerative crop raised, and consequently almost everything else has given way to it.

The crop of 1874 is not over a half crop, the average yield of corn not being more than 25 bushels; wheat and oats, 12 bushels per acre,

Tobacco is not raised for market, the soil and climate not being suitable for it.

It is estimated that in 1873 over 10,000 bales of cotton were shipped from Dunklin county, but owing to the excessive drouth in 1874, not more than about 6,000 bales will be shipped.

Rye, castor beans, broom corn, sorghum, etc., do well, and are raised for home consumption.

No blue grass, timothy or clover are used for pasturage; the former is slowly spreading over the whole county without any efforts having been made in that direction. Little improvement has been made in any class of stock, except hogs. The whole county being almost a natural pasturage, few farmers see the advantages of a stock law. The common rail fence is generally used, costing about $250 per mile, with a cost of $10 per year to keep it in order. There being an abundance of timber for fencing purposes, little attention has been paid to hedges.

There are only a few orchards at present in this county, which produce excellent fruit; of late much more attention has been paid to fruit-raising. Wild grapes grow luxuriantly, but no improved varieties are raised.

There are no facilities for the transportation of produce to market, except by wagon, over roads of the poorest description, so that it costs more to get produce hauled to a shipping point than it does to get it to market after it is once there.

There has been but very little immigration since the war.

Little favorable can be said of the interest taken by the citizens of this county in educational matters, and the schools are therefore not in such a condition as they ought to be. For statistics of schools (see table.)

FRANKLIN COUNTY.

This county is situated on the south side of the Missouri river, and bounded on the east by St. Louis county. It was organized in 1818, from St. Louis county. The surface of the county is hilly, mostly covered with timber. Its soil in the river and creek bottoms is very rich, mostly all tillable, and very productive. About three-fourths of the upland in the northern, and one-half in the southern part is tillable. The bottom lands (of which about 15,000 acres border on the Missouri), are famed for their fertility. The upland in the southern part of the county is not so productive, but excellent for fruit and grapes. The upland in the northern part produces good crops of corn, wheat, tobacco, oats, grapes, etc.

The county is well supplied with timber, consisting of oak, walnut, hickory and other hard wood. It is also well watered by many streams, principally by the Meramec, Bourbeuse and Bœuf rivers, which afford immense water-power.

Mineral lands exist in large quantities, covering about 125,000 acres, and are not adapted to agriculture. They are located in the southern part. Lead, iron, and sometimes zinc and copper are found; also coal in the central part of the county. A great deal of mining has been done along the A. & P. R. R., but there are no mines in operation now, except the "Virginia" and "Silver lead mines.

The climate is generally mild and very healthy.

There are about 17 or 18 flouring-mills in this county, but no other factories, except the "Moselle Iron Works" and "Washington Planing Mill."

The census of 1870 gives 120,666 acres of improved land; 194,877 acres of woodland, and 56,811 acres of other unimproved land. The average price of improved farms is $23 to $25 per acre; of unimproved land, $8 per acre, and of unimproved bottom land, about $18 per acre. The price of land is about the same as just after the war.

The census of 1870 gives 30,098 inhabitants. Their leading occupation is agriculture.

The principal productions are wheat, tobacco, corn, oats and hay, of which wheat and tobacco are mostly exported. The wheat crop of 1874 compares favorably with that of previous years, but the corn, oats and potato crops are below their usual average. The average yield of 1874 is about 20 bushels of wheat; 20 bushels of corn; 25 to 30 bushels of oats; two tons of hay, and 50 bushels of potatoes, per acre.

Tobacco is cultivated for market, especially in the northern part. Barley, rye, hemp, flax, castor beans, etc., were cultivated more than in former years.

Blue grass and other cultivated grasses are little raised for pastures, but do well.

Much interest has been taken in improving the stock of Franklin county, and with gratifying results.

The county is well adapted to sheep-raising, but the dogs do considerable damage. A stock law is wanted by only about one-sixth of the farmers.

Rail fence is mostly used, the cost of building and keeping them in repair being not great, since there is plenty of timber.

Orchards as a rule, or rather when well attended to, do well, and produce an abundance of good fruit. Some attention has been paid to viticulture, the soil and climate being well adapted to it, and the wine made finds a ready sale.

The facilities of transportation of the surplus products of the county are very good, both by railroad and river. There are two railroads traversing the county, the M. P. R. R. running parallel with the Missouri river, and the A. & P. R. R. running through the eastern and southern part of the county.

There has been only a comparatively small influx of immigration to this county since the war, mostly from the eastern States and Europe.

The county has numerous and good public schools (see table), and the people take a lively interest in them.

GASCONADE COUNTY.

It is situated in the east central part of the State, and was organized November 25, 1820. It is an agricultural county, and abounds in hills, bluffs, springs, rivers, streams, etc., with prairie, plateau, gentle slope and rich bottom land—has in fact every variety of surface known to Missouri.

There is an abundant supply of timber in the central and southern parts and along the Gasconade river, and much of the land within 15 miles of that river being so broken that it is likely to remain in timber, except the valleys, which are already under cultivation. In the northern and northeastern part of the county the young growth is rapidly growing up, so that, if judiciously managed, there will be more timber than formerly.

The rich bottom lands, the broad ridges and the fine undulating prairies, very fertile, all invite the farmer,

Iron is thought to exist in large quantities, as ore of an excellent quality is found on the surface in large quantities, principally in the southern and western portions of the county, but there being no railroad facilities, no mines have been opened.

A lead mine was opened on the Bourbeuse, but abandoned for want of proper machinery to exclude the water. Silicate, sulphuret of zinc and coal have also been discovered, the latter in the southeastern part of the county.

Of manufacturing establishments, there are a large merchant-flouring-mill, with five run of burrs, and several public mills, which also ship some flour. Besides some small shops to make plows, wagons, etc., to order, there are no other manufacturing works.

The census of 1870 gives 47,620 acres of improved land; 177,786 acres of woodland, and 422 acres of unimproved lands. The price of improved farms range from $10 to $25 per acre, according to quality or degree of improvement; small tracts planted in vines or fruit trees will of course exceed this. Bottom farms are worth from $25 to $40 per acre; unimproved land, from $5 to $15 per acre; the latter bottom. The price of land has decreased since 1867 and 1868, owing to cessation of immigration, failure of crops on account of drouth and chinch bugs, accompanied by a general decline of agricultural products, and to the general depression of business and scarcity of money.

The number of inhabitants (census, 1870) was 10,093. Their leading occupation is agriculture.

The leading products are wheat, corn, oats, rye and Irish potatoes. Of these the principal export is wheat; corn and oats being used to feed stock, much of which is shipped annually.

The average yield per acre of wheat is about 15 bushels; oats, 25 bushels; corn, 30 bushels; some bottom land, however, yielding 60 or 70 bushels of the latter per acre. All other cereals and fruits are successfully raised for consumption at home.

The county is well adapted to the growing of tobacco, but the cost of transportation, and the "monopoly law," as it is sometimes called, has caused a very decreased amount to be raised.

Blue grass grows spontaneously in this county, and some farmers are making very fine pastures of it. Gasconade county is well adapted to the raising of stock, and some of it is shipped annually to market.

The election in November, 1874, has shown that the people do not want a stock law, it being defeated by four to one.

Rail fences are about the only kind in use, costing about $180 per mile, with an annual repair of $10. In the northern and northeastern parts of the county the expenses are greater.

The people are generally successful in fruit-raising, the only drawback being the "borer," which destroys many apple trees.

There are more than one thousand acres planted in the different varieties of grapes, giving an annual yield of 260 gallons per acre (in some years yielding 500 and more.)

The only shipping facilities are in the extreme northern part of the county, leaving the middle and southern portions from 20 to 35 miles from any railroad or means of transportation.

For about 5 years after the war there was quite an influx of German immigrants, which for the last two or three years has to some extent subsided.

Nearly every sub-district has a substantial school building and good teachers. The school at Herman is the largest and best furnished, and is occupied 11 months in the year.

GENTRY COUNTY.

Gentry county is one of the northwestern counties in the State; it was organized February 12, 1841. The surface is generally rolling or undulating, with the exception of the bottom lands along the different branches of Grand river. The great body of the land is prairie of the richest quality, and is well adapted for both stock-raising and grain-growing.

There is a large belt of oak timber extending through the county from north to south, several miles in width, and on which, when cleared and well farmed, grows the best of fall wheat. About one-third of the county is timber, and of a fine quality for building, fencing and other purposes, enough to supply all the wants of the future.

The soil of the county is very black, and is what might be called a rich, black loam, and is not local, but characterizes the whole county, and there is not one acre in five but is well adapted to cultivation.

There is but one river in the county—Grand river, running in a southeasterly direction through it, and meandering in such a way as to afford large bottoms. It is fed by numerous streams, running in from east to west, and furnishing all the necessary water for stock.

The water-power in this county is not as good as in many other counties; however, Grand river has a sufficient volume of water at many places to run any kind of machinery.

Coal is found near Elenorah, the only place in the county as yet in which it has been discovered, and is used on a small scale for blacksmith purposes. No other mineral has as yet been developed.

The climate, in general with all of northwest Missouri, is mild and healthful. There are no swamps nor wet lands; the air is dry and bracing, so that lung complaints are scarce. The heat of summer is tempered by constant breezes from the south, and frequent showers, and the nights are always cool.

The manufacturing establishments consist of seven flouring-mills, four of which are water-mills and three steam-mills; one woolen factory; one foundry, and one cheese factory.

The census of 1870 gives 83,959 acres of improved land; 63,967 acres of woodland, besides 48,430 acres of other unimproved land. The average price of improved farms is about $15 to $20 per acre; of unimproved land, about $5 to $10 per acre, and of timbered land, including the fine bottoms and uplands, about $15 per acre. The price of land advanced from the close of the war until about theyear 1871, from which time a gradual decline has taken place.

The number of inhabitants in 1870 was 11,607; their leading occupation is agriculture. Corn, oats, wheat and rye are the principal staples; pork and beef are the commodities for export. The crop of 1874 is the poorest since 1860, produced by drouth and bugs. The usual average yield is as follows: Corn, 40 bushels; wheat, 15 to 20 bushels; oats, 45 to 50 bushels; hay, 2 to 3 tons, and potatoes, 150 bushels per acre.

Some tobacco is cultivated, growing finely on this soil and yielding about 1,200 pounds per acre. Other cereals and vegetables grow successfully, but are cultivated only to a limited extent for domestic use. Farmers depend a great deal on the prairies for pasture. Blue grass is the natural growth of the county, and naturally takes the place of all other grasses when killed out by stock or otherwise.

Great numbers of stock of all kinds are raised for market. Some fine breeds of hogs and cattle have been successfully introduced into the county.

Gentry county offers great inducement to the raising of sheep, and so far as tried, has proved profitable. A stock law is not wanted at present by a majority of the people.

The most universal fence in use is the rail fence, as most farmers have yet plenty of timber for that purpose. Osage orange hedges are extensively used, and answer the purpose for turning all kinds of stock.

This is a fine fruit county, and the numerous orchards seldom fail to yield an abundance of the very best of apples. But little attention has been paid to the culture of the grape, except for home use.

The facilities for transportation are not by any means the best, and the county is not celebrated as having the best roads in the State. There is no railroad in the county. The grain is mostly all used at home, and the bulk of the fattened stock goes mostly to Chicago, except a good number of hogs, which find their way to St. Joseph.

There has been a large influx of immigration to this county since the war, mostly eastern people, and of the farming class.

The county as a home for the hardworking, industrious man, has no superior, and but few equals in this or any other State in the Union. The land is of the very best kind, and cheap, and the climate healthy and mild.

A growing interest is manifested in schools, and better teachers are employed, and most every sub-district has a good school.

GREENE COUNTY

This county is situated in the southwestern part of the State, and was organized January 2, 1833. It is situated and mostly extends over the highest summits of the Ozark mountains, which here attain an elevation of about 1500 feet above St. Louis; the county thus forms a part of the great dividing ridge between the lower Mississippi river and the Missouri river. The general surface of the county is undulating and broken, with rich and fertile prairies in the western and southwestern parts, and rolling timberland in the southeastern and eastern. The large, gently undulating prairies have a dark mulatto or brownish-red soil, from 6 inches to 5 feet in depth, with a darker colored subsoil with stone and gravel. About two-thirds of its surface is covered with timber, a part of which is hilly, and in some localities stony; while the other part is the timberland and is composed of excellent alluvial bottoms, hickory barrens, well adapted to the culture of tobacco.

The soil is mostly excellent, and even on the stony hills is found fine pasturage ground set with blue grass. The county is well watered by many fine rivers and creeks, and there is probably no other county in the State possessing as many fine springs, some of which are powerful enough to drive any amount of machinery, with water as clear as crystal. The larger streams are very rapid, and also afford unrivalled water power. Timber is very abundant for all present and future practical purposes and some extensive pineries are also found within its limits. The county possesses, two natural bridges, and many large caves, out of which flow some of the clearest and most beautiful springs in the world. The celebrated Knox or Lincoln cave lies some seven miles northwest of Springfield. It is about 1,000 yards in length, and contains many spacious apartments, caverns or niches, excelling in scenery any cave known in the West. In its most remote depths, a beautiful stream flows, with water some ten feet deep, and of perfect clearness and purity. Travelers passing through Springfield seldom fail to avail themselves of the opportunity to visit this great natural curiosity.

Both lead and iron are said to exist in paying quantities, but are not mined. The developments of the next few years will doubtless reveal rich deposits of these minerals. The county is well supplied with manufacturing establishments, viz: fifteen flouring-mills, twelve saw-mills, one woolen-mill, two planing-mills, several large tobacco manufactories, one cotton factory, and several carriage factories, foundry and machine-shops, mostly situated at Springfield, the county seat and metropolis of the Southwest. The county had, in 1870, 93,095 acres of improved land; 121,647 acres of woodland, besides 21,348 acres of other unimproved land. The prices of land at present are quite low, but, of course, higher near the city mentioned, and invite the people in search of cheap homes. The A. & P. R. R. have about 78,000 acres of good land, which is in the market, and offered on favorable terms. About 2,000 acres of government land, of poor qnality, are also in this county. The census of 1870 gives 21,549 inhabitants, mostly employed with farming. The agricultural staples are wheat, corn, oats, rye, barley, tobacco, hay, fruits, etc. Immense quantities of wheat are raised annually. Timothy, clover and blue grass grow luxuriantly, and the climate being mild, the county offers great inducements to stock-raising, and great numbers of neat cattle, hogs, mules, horses and sheep are annually marketed.

A vast improvement is being manifested in the quality and the numbers of improved animals of all kinds. This county claims to be one of the best fruit-growing counties in the State; its altitude above the level of the sea, the excellent natural drainage and mild climate make it particularly well adapted to the culture of all fruits, and many large orchards are found scattered over its surface, producing annually a large quantity of good fruit, The grape also succeeds admirably. The A. & P. R. R. have about thirty miles of track, and the M. K. & T. C. R.R. has more than that number graded, affording excellent means for transportation. The county received a very fair share of the immigration since the war, and is rapidly filling up with an industrious class of citizens. Greene county is well supplied with public schools (see table), and progress is the order of the day. The school houses in Springfield and North Springfield are large and commodious buildings, and there are also some well attended private schools.

GRUNDY COUNTY.

Grundy county is one of the more northern situated counties, being in the second tier of counties south of Iowa. It was organized January 2, 1841. The upland prairies—about two-thirds of the area—are gently undulating, and contain a rich soil of deep black mould. This prairie land is well diversified with timber, and is nearly all under fence. One-third of the county is upland and ridges, mostly covered with timber. The latter is principally found along water-courses, of which there are many, and some of them affording excellent water-power, capable of running a great deal of machinery. Timber is abundant, and will be so for years to come, since the young timber is growing rapidly to fill up the ranks of the old monarchs of the forest. A considerable amount of railroad ties is being shipped from here to other States. The only mineral found thus far is coal, but firewood being so very cheap, is not worked. The county contained, in 1870, 89,892 acres of improved land; 56,164 acres of woodland and 40,089 acres of other unimproved land. The prices of land have declined in the last four years; they are now about $15 to $20 per acre for improved land, and $7 to $10 per acre for unimproved land. Except four flouring-mills, some twenty steam saw-mills, one large woolen factory and a few cheese factories, there are no other manufacturing establishments. The population of Grundy county is 10,567 (census of 1870). Their leading occupation is agriculture. The principal crops are corn, wheat and hay; articles exported, are mostly wheat, cattle and hogs. The average yield of 1874 is not nearly like the usual one, on account of the extreme drouth.

The average yield of former years may be stated as being for corn, 40 bushels; wheat, 16 to 18 bushels; oats, 30 to 35 bushels; hay 1½ to 2 tons, and potatoes, 125 to 150 bushels per acre.

Grundy county was formerly famous for its tobacco, but at present its cultivation is neglected. Rye, a sure crop; flax, castor beans, sorghum, buckwheat, sweet potatoes, etc., are grown in limited quantities, and only for consumption at home. Blue grass is growing extremely well in this county, and wherever prairie grass has been killed this fine grass comes in naturally. Timothy is raised to some extent for hay, and succeeds well.

On account of the many unfenced prairie and timber bottoms, which form an excellent range, but few farmers are in favor of a stock law.

Much attention has been paid of late to the improvement of all kinds of stock, and the old native stock is fast disappearing.

There are a great number of young producing orchards in Grundy county, producing an abundance of such fruit as are adapted to this latitude.

Very little has been done to raise grapes, and there are only about forty acres devoted to viticulture. The principal market is Chicago, this county being connected with that city by a railroad running through the county seat.

Since the war there has been a considerable influx of immigration to this county, a majority from Ohio, though also from Iowa, Minnesota, Illinois and Indiana, with great inducements of cheap and rich lands and a healthy climate.

Grundy county ought to attract immigrants. The schools in this county are doing well, and many excellent teachers are employed, the citizens being deeply interested in educational matters.

HARRISON COUNTY.

This county was organized February 14, 1845. It is situated in the northwestern part of the State. About two-thirds of its surface is undulating, and has a good, black loam soil, resting on clay, which if subsoiled displays great producn g strength; the other one-third is tolerably broken. About two-thirds is prairie, one-third timberland. Timber is not what might be called abundant, but there is yet enough for all practical purposes, such as for fuel, building, fencing and railroad ties; young timber is also growing up rapidly. The East Grand river is the principal water-course, and with many smaller creeks and streams affords an abundant supply of water for farm and stock use. The water-power is tolerably good.

Coal has been found in several places in this county, but is not worked thus far.

There are several first-class flouring-mills in operation, doing a lively business; also two woolen-factories, and one foundry.

The census of 1870 gives 109,489 acres of improved land; 77,223 acres of woodland, besides 100,350 acres of other unimproved land. The average price of improved farms is $15 per acre; of unimproved land, $6; of timber, $8; and of prairie, $5 per acre. The price of land since the war advanced for awhile, and then decreased to about the same figures as before the war, chiefly accounted for by immigration going farther west to buy still cheaper lands.

The population, 14,635, (census 1870,) is an agricultural one. The agricultural staples are wheat, corn, oats, rye, hay and potatoes; the commodities exported are wheat, oats and rye. The corn crop of 1874 is about one-half of a crop, but wheat, rye, oats and hay are about an average yield. Tobacco and cotton are not cultivated for market to any great extent, but grow well. Other cereals and fruits are cultivated for home consumption, and with good success.

Blue grass, timothy, red clover and red top are successfully, but not extensively used for pastures, the farmers depending on the wild range. Farmers with large meadows let their stock run on them during the cold months. Timothy is largely cultivated for hay. The county is extremely well adapted to raising cattle, horses, hogs and sheep, and large numbers are annually shipped to market.

Considerable improvements have taken place in the breeding of better stock. Sheep-raising is very profitable, and Harrison county is, as the statistics show, one of the first sheep-growing counties in the State; the injury from dogs and wolves is not great. A stock law is not wanted at present; it was voted down by a considerable majority at the last election.

The rail fence is mostly in use, though plank and hedge fences are also used to some extent. There is an abundance of timber left for fencing uses, so that the price of putting them up is not very great. Osage orange hedges have proved to be a success. Farmers are very successful in raising fruit, and a very large number of fine orchards are found in this county. About 200 acres are planted in grape-vines; wine is made in small quantities and finds a ready market.

The facilities for transportation to market are two railroads, one running east, and the other south of the county. In the extreme northern part of the county farmers are favored by another railroad, running near the Iowa boundary line. St. Louis and St. Joseph are the principal markets.

There was a very heavy immigration after the war, mostly from Ohio, Pennsylvania, Illinois and Iowa.

The people in this county manifest considerable zeal and industry in sustaining the public schools, and the educational interests are in an excellent progressive condition. (See table.)

HENRY COUNTY.

Henry county is situated in the western part of the State. It was organized December 13, 1834. The county is situated on the southern slope of the ridge between the Missouri and Osage rivers; its surface is generally undulating, is mostly prairie, well diversified with a heavy growth of timber along the numerous water-courses; a small portion of the southern part is broken, hilly and well timbered. The leading varieties of timber are the different kinds of oaks, walnut, hickory, pecan, hackberry, elm, etc., giving a good supply for all practical purposes. The soil is mostly a dark loam with a small mixture of sand, and very productive; there is very little waste-land in the county, but affords many natural advantages for farming and stock raising.

The county has in all parts an abundance of water for stock, and also good water-power. The latter is principally found on the Grand river, which flows diagonally in many curves through the county from northwest to southeast. The climate is mild and salubrious.

Coal of good quality seems to underlay the greatest part of the county; it is regularly and extensively mined along the line of railroad, and used throughout the county, selling from ten to fifteen cents per eighty pounds. There are also indications of iron and lead in the southeastern part of the county. Lime and sandstone for building purposes also abounds.

The manufacturing establishments of the county are adequate to the demand, There are 8 large flouring-mills; several grist and saw-mills; two machine shops making agricultural implements, wagons and buggies, and one woolen factory.

The county had, in 1870, 148,462 acres of improved land; 57,075 acres of woodland; and 70,821 acres of other unimproved lands. The price of improved land ranges from $10 to $25, and of unimproved land from $3 to $12 per acre. The leading occupation of the 17,401 inhabitants (census 1870,) is agriculture. Corn, wheat, oats, and hay, are the agricultural staples, and they usually yield large crops. Other cereals and vegetables are also grown successfully for home consumption. Tobacco was formerly grown to some extent and of a good quality, but less so of late, the freight and the law taking the lion's portion of the profits. Exports are chiefly flour, wheat, neat stock, hogs, horses, and mules.

Stock-raising is the great source of profit to the farmers in this county; great numbers of stock of all kinds being shipped annually to the market. Marked improvements of all kinds of stock are visible, and blooded stock is rapidly introduced. Little attention has been paid to the raising of sheep, which is profitable, though dogs are also a great pest in this county.

Timothy, blue grass, red top and other grasses are profitably grown. Many of the best farmers wish for a stock law, but the majority is against it as yet. Rail and plank fences are mostly used. The Osage orange hedge is successfully grown, and will soon be the prevailing fence.

Considerable attention has been and is paid to the raising of fruits of all kinds adapted to this latitude, and Henry county is claimed to be one of the finest fruit-growing counties in Missouri. A number of small vineyards, aggregating some eighty acres, are in this county, and viticulture is attracting much more attention than formerly.

The county has good facilities for transportation, having the M. K. & T. R. R. running diagonally from northeast to southwest through the county, and the M. & K. C. R. R.

Nearly every family is within easy access of a good school; the county being well supplied with public schools, with able teachers. (See table.) There are also several select and graded schools.

HICKORY COUNTY.

This county, organized February 14, 1845, is situated in the southwestern part of the State. The surface is generally rolling, with some rocky hills and ridges; about two-thirds of it is covered with fine groves of timber; the rest is prairie. These prairies situated in the eastern and western portions of the county are gently rolling, and as healthful and productive as the most enthusiastic farmer can desire. The timberland forms a broad belt on either side of Pomme de Terre river, which flows from south to north through the center of the county.

The principal timber on the hills are the different kinds of oak, while large walnut, oak, ash, hickory, maple and sycamore are found in the bottoms.

The soil is of almost every kind, from the richest alluvial bottoms to the flinty ridges. Black loam with clay subsoil, susceptible of a high state of cultivation, forms the soil of the prairies.

The principal minerals found in Hickory county are lead and nickel. The former is found in a territory covering an area of about one-fourth of the county. Three or four mines are worked at present, and there is one smelting furnace, now not in operation. Nickel mines have been discovered, but not enough worked to know the extent and value of them. Iron and copper are also found, but no coal.

According to the last census, Hickory county contained 39,191 acres of improved land; 77,790 acres of woodland, and 17,919 acres of other unimproved land.

The present average price for improved land is about $10 per acre; for unimproved from $2 to $5 per acre. The price of land has decreased at least fifty per cent. in the last three years, although after the war there was a considerable influx of immigration, principally from Indiana and Illinois.

The leading occupation of the inhabitants (6,452, according to census of 1870) is agriculture, there being no manufacturing establishments in this county, except one woolen-mill; three steam flouring-mills; three water-mills; six steam and three water saw-mills. The staple productions are corn, averaging from 30 to 40 bushels per acre; wheat, about twenty bushels; oats, from 25 to 30 bushels, and timothy, 1 to 1½ tons per acre. Tobacco and cotton are little grown, the latter only for home consumption.

Hickory county is well adapted for stock-raising, having an abundance of natural pastures in the prairies and on the hill-sides, and being traversed by many fine streams, affording the necessary water for the stock. Sheep-raising could be made very profitable. Thousands of tons of grass dry up annually and serve no better purpose than to burn up farms.

Considerable interest has been taken of late in fruit-raising, and fine orchards are springing up everywhere, yielding an abundance of good crops.

The nearest railroad is some fifty miles distant. The educational interests have been somewhat neglected in several parts of the county, but much more interest is manifested at present by the people, and more able teachers and better school houses are found now than formerly.

HOLT COUNTY.

Holt county is one of the six counties organized from the territory acquired by the United States by treaty with the Missouri, Sac and Fox and Iowa tribes of Indians in 1836, and added that year by act of Congress to the State of Missouri. The county is situated in the northwestern part of the State, and was organized January 2, 1843.

The surface of the county is divided into three grand divisions, viz: undulating prairie, river bottom and "bluff," or timberland, all fertile and well adapted to agriculture and horticulture.

Prairie is predominating, and is very productive of corn, and all the cereals grown in this latitude, as well as of the root crops.

The bluffs are excellent for fruit-raising, and are the home and pride of the German horticulturist, and much of them are good farming lands, having a very fertile soil.

The bottoms have scarcely any bottom to their black alluvial deposits from the great "Big Muddy," and a large amount of them are now good farming lands. A considerable portion of these bottoms are subject to overflow, but will soon be reclaimed by the system of dykeing and ditching in which the county is now engaged.

The soil of the prairies is a sandy loam, not underlaid by hard pan or any substance that would operate to prevent thorough drainage. The county is well watered by the Missouri river, forming the western and southern boundary, and by the Nodaway river on the eastern border.

Timber is still abundant, covering about one-third of the county, principally in the southern and western parts. A large amount of it has been shipped in the shape of railroad ties.

Minerals have not been discovered yet, although coal is reported to be found within the corporate limits of Mound City. Kunkel's mineral fountain is said to possess considerable medicinal properties.

The census of 1870 gives 70,826 acres of improved land; 52,751 acres of woodland, and 42,151 acres of other unimproved land. The prices of land range from $10 per acre for raw prairie; $25 per acre for timber, owing to location, etc. Improved land can be bought from $20 to $40 per acre. The prices of land have decreased about 25 per cent. during the last four years.

The manufacturing establishments of Holt county are 11 flouring-mills, of fair capacity; 12 saw-mills; one woolen and several cheese factories.

In 1870 there were 11,652 inhabitants, whose leading occupation was agriculture. The principal staples are about as follows in their order of importance: corn, wheat, oats, barley and potatoes. Articles exported are hogs, cattle, wheat, barley and potatoes. The average yield of these crops in 1874 has been below the usual average on account of the Chinch Bug. Tobacco and hemp are raised in limited quantities. Blue grass is extensively used for pasturage, and it seems to be indigenous to the soil.

There is still a large extent of native grass in the county, which affords pasturage for thousands of cattle during the warm weather.

Comparatively little improved breeds of stock have thus far been imported. Dogs and wolves make sheep-raising a hazardous business. A stock law is not wanted at present by a majority of farmers. Rail and plank fences are mostly used; Osage orange hedges have been planted to some extent, and with great success.

Nearly every farmer is engaged in fruit-culture, and fine orchards abound, producing an abundance of fruit, suitable for the latitude of the county. Viticulture is also a success. Besides the Missouri river, the K. C., St. Jo. & C. B. R. R., running through the entire length of the county, furnishes all the desired facilities for markets, which are St. Louis, Kansas City, St. Joseph and Chicago, the latter city receiving the most cattle.

Immigration, chiefly from the Eastern States, was considerable in the first four years after the war, but has ceased to a great extent since then.

Good public schools are in operation in most of the sub-districts of the county, and much interest has been taken in employing competent teachers. (See table.)

HOWARD COUNTY.

Howard county is situated north of the center of the State. It was organized January 23, 1816. The general surface is undulating and timbered, with the exception of cleared land, and is without prairies.

The soil is a clay loam, very fertile and productive when properly worked. The Missouri river runs along the southern and western boundary of Howard county for about 42 miles; there are no rivers of large size running through the county, but numerous creeks, some of them quite large.

The water-power is limited, and steam is mostly used from water in wells. Timber is abundant, and enough to prove adequate to the future demands for railroad ties, fences, building timber, fuel, etc.

There is an abundance of coal in the county, but as yet it is not mined to any great extent. The county has five flouring-mills, the largest of which is producing from two to three hundred barrels of flour per day; some small woolen factories; a small establishment for the manufacture of plows, wagons, etc., and one cheese factory.

There are (census of 1870) 128,342 acres of improved land; 116,418 acres of woodland, besides 363 acres of other unimproved land. The average price of improved farms is now about $15 per acre, and of unimproved land $8 per acre. The prices of land have decreased since the war. The number of inhabitants in 1870 (census) was 17,233.

The leading occupation is agriculture. The principal staples are wheat, corn, hay, tobacco, oats, rye and potatoes. Wheat, corn and tobacco, including live stock of all kinds, are exported.

The crops of 1874, except wheat, are not over one-half the average yield of previous years, caused by a severe drouth and the ravages of the Chinch Bug. The estimated average yield in 1874 of corn is 20 bushels; wheat, 15 bushels; hay one ton; potatoes, 20 bushels per acre.

The county is peculiarly adapted to the growth of tobacco; it is cultivated to a great extent, and the tobacco acreage will be greatly increased the next season. Barley, rye, hemp, flax, castor beans, broom corn, sorghum, etc., are grown successfully to a limited extent.

Blue grass and clover are used to a large extent for pasturage, the soil being admirably adapted to their growth, and many farmers claim that it falls little short of the famed blue grass regions of Kentucky.

Neat stock, horses, mules, sheep and hogs are raised in large numbers for export, and improved breeds of all kinds of stock have been introduced with good success.

Sheep-raising is profitable, were it not for injury incurred from the destruction by dogs. The county voted at the late election in favor of the license law respecting dogs. A considerable number of farmers are also in favor of a good stock law.

Fences most in use are rail, plank and picket, about 75 per cent. of the former, there being an abundance of timber.

Comparatively little attention has been paid to the growing of hedges, which have proved successful when tried with proper care.

Orchards are generally very successful, if properly treated, and if the pruning is not done by the stock. A considerable number of acres have been planted in grapevines, and some good wine is made; the county appears to be well adapted to the growth of the grape and the small fruits.

The principal market is St. Louis, reached by the Missouri river, which is navigable the greatest part of the year, and with a railroad running through the center of the county from north to south.

There was some immigration to the county after the close of the war, and there is plenty of room for more. Land is good and cheap, and the climate healthy.

There are good shipping facilities, and the educational advantages are as good as in any other county in the State.

This county is well supplied with schools, as can be seen by annexed table, and the people manifest quite a lively interest in educational matters.

HOWELL COUNTY.

Howell county was organized in 1857, from parts of Oregon and Ozark. It is situated in the southern tiers of counties on the Arkansas line, nearly in the center from east to west. The surface of the county is generally rolling, with a southern slope; it is principally timber, consisting of an abundance of pine, white, black and post oaks and hickory, interspersed in the southern and western parts with small prairies.

The many valleys, which are found on all the water-courses, are fertile, and much of the uplands produce all the grains and tobacco in great abundance. The soil on the uplands is principally a sandy loam, with a subsoil of a red, oily clay, impregnated in many localities with iron. Some of the ridges are covered with sandstone, flint and conglomerate rocks.

The county is well watered by many fine streams, fed by a great number of very fine cold and clear springs. Well known is the subterraneous head of the Spring river, which, running for a few rods on the surface, suddenly disappears again. The many creeks and springs furnish plenty of stock water; also water for steam machinery.

Iron is found in great abundance, and the lead indications are good, but have not yet been developed, and no mines are in operation.

Timber is abundant for railroad ties, fences, building material and fuel. The best pinery in the State is located in the northern part of the county, and only about one-tenth of all the timber has been destroyed and cleared off during the last ten years.

Fires are the great enemy to these timberlands, and the county would be greatly benefited to have stringent penal enactments against firing the woods.

The climate of Howell county is mild and healthy. Snow seldom falls over three or four inches, and remains only for a few days.

The following are the manufacturing establishments: An excellent flouring-mill and one good saw-mill.

The census of 1870 gives 12,934 acres of improved land; 61,283 acres of woodland, and 2,989 acres of other unimproved land. The average price of improved lands is about $12.50 per acre, and of unimproved lands, $8 per acre. The number of inhabitants in 1870 was 4,218. They are mostly employed in agriculture.

The leading staples are wheat, corn, oats, potatoes, cotton and tobacco. Articles exported are wheat, cattle, hogs, cotton and tobacco. The average yield of crops in 1874 does not compare very favorably with that of former years, being not over one-half the usual average yield. It was, of corn, 20 bushels; wheat, 15 bushels; oats, 10 bushels; rye, 15 bushels; cotton, 600 pounds, and of tobacco 600 pounds per acre.

Tobacco and cotton of a fair quality are extensively raised, and the cultivation of them would be still more extended if the county was nearer to any railroad. Other cereals and fruit succeed well, but are raised to a limited extent for consumption at home.

The cultivated grasses do well as far as tried. But little attention has as yet been paid to their cultivation, the wild grasses furnishing good summer and fall ranges. A stock law is not wanted.

Howell county is extremely well adapted to the raising of stock, having a fine range almost through the whole year. Comparatively few improved breeds of animals have been introduced. Sheep-raising is profitable, and diseases are not known among them.

The principal fence is the rail or worm fence, there being plenty of timber for that purpose.

Howell county is a paradise for the fruit-grower; apples, peaches, pears, and all the small fruits, so far as tried, yield good and large crops. Viticulture is yet in its infancy; the soil and climate are well adapted for the growth of vines.

Market facilities are poor. All the produce has to be hauled by wagon to Rolla, on the A. & P. R. R., a distance of about 100 miles. There was considerable immigration to this county after the war, mostly from Illinois, Ohio, Tennessee and Kentucky.

The county is well supplied with schools, and can boast of some very excellent teachers. (See table.)

IRON COUNTY

Is situated in the southeastern part of the State, and was organized February 17, 1857. The divide of the Ozark runs through Iron county from east to west; the surface is hilly and broken, so that not more than one-twentieth of its area is considered arable, though much of the mountain land, now considered worthless, except for timber, could be made profitable for vineyards and fruit.

The county is full of springs and streams. The tillable land lies in narrow valleys. The soil generally consists of yellow and red clay, with numerous alluvial bottom lands. Timber is superabundant in the hills; generally white oak and pitch pine. In the larger valleys, and for 10 or 12 miles around the iron-works, the best timber has been cleared off, and a great deal of it wasted.

Iron is everywhere, and every variety and quality of its ores, except red hematite, which, though found in many places, has as yet not been found in large bodies. There are iron mines at Pilot Knob, Sheppard's mountain and Hogan's mountain, with a furnace at Pilot Knob. Iron mountain is on the east line of the county and there are two furnaces. A lead mine has been opened about ten miles east of the county seat. Lead is found in many other places, but not in any quantity. Granite and Kaolin ochres are abundant. About 65 hands are now employed about the Knob; perhaps 100 at the Granite quarries; but as soon as spring opens the quarries will employ as many as 600 men. The granite for the bridge across the Mississippi at St. Louis, for the State House at Springfield, Illinois, and the Custom House at St. Louis, was quarried in this county. Species of copper and zinc are found in every part of the county.

According to the census of 1870, the county had 15,477 acres of improved land; 1,615 acres of unimproved land; and 53,435 acres of woodland. The average price of improved lands is about $20 per acre, and of unimproved land from $1 to $10 per acre. according to quality and amount of timber on it. There is no prairie, and the bottoms are rarely large enough to be valued separately from the hill or upland. The price of land advanced rapidly soon after the close of the war, but is lower now in consequence of hard times and general unprofitableness of farming.

The county has three flouring-mills and a number of grist and saw-mills; two carding-mills; one foundry and plow-factory; two planing-mills; two brickyards; several wagon-shops and plenty of blacksmith shops.

The county had 6,278 inhabitants in 1870, (census), whose leading occupation was mining and agriculture.

Corn, wheat and oats are the staple crops, and not enough is raised to supply the home consumption; farmers being mostly of the "land-robber" class, paying too much attention to making and hauling charcoal.

Crops of 1874 are about the same as for 1873, but not as good as for several previous years, except wheat, which was an unusually good crop. Tobacco, cotton, barley, rye, hemp, flax, etc., are all successfully grown to a limited extent.

Blue grass grows spontaneously, clover and timothy yield heavily; orchard grass and red top also do well; clover and timothy are growing in favor and are cultivated more and more every succeeding year.

Improved breeds of cattle, hogs and sheep have been introduced; no neat cattle are exported. Iron county is an excellent county for sheep-husbandry, but as yet there are only a few stray flocks of sheep.

Few farmers desire a stock law. The common rail fence, without stakes, is the rule, but plank fences are becoming common, as rail-timber in the larger valleys is getting scarce, and it is cheaper to haul lumber than rails from the hills.

This county is well adapted to horticulture, and orchards do well. Viticulture is yet in its infancy, though garden vineyards are becoming numerous and yield abundantly.

The I. M. R. R. runs through the county north and south; the wagon roads are good most of the year, and it may be said that the facilities for transportation exceed the products.

Perhaps one thousand persons have settled in Iron county since the close of the war, and five or six hundred have left it. There is a large class of miners, quarrymen, stone-cutters, colliers and choppers, that come and go, as business is brisk or slow, at the iron or granite works.

According to the Superintendent of Schools of this county, the public schools are in "full blast!" The county is well supplied with public schools, which are improving rapidly; the Arcadia college, now completed, is a fine building, beautifully situated.

JACKSON COUNTY.

Jackson county is situated in the western part of the State; is bounded on the north by the Missouri river, and on the west by the State of Kansas. It was organized December 15, 1826. The general surface of the county is gently undulating, except near the river, where the well known bluffs are found.

The county is, or rather was, about equally divided in timber and prairie lands. The latter have a rich alluvial soil, of an average depth of two feet. The bottom lands of the Missouri river are famed for their unusual fertility.

There is an ample amount of timber well distributed through the varous sections of the county for all necessary purposes, mostly found skirting the many water-courses, and on the river. The county is well watered by large and small creeks and never-failing springs, which afford an abundant supply of water for all farming purposes.

Besides excellent building stone, the county is well supplied with beds of bituminous coal, 28 to 30 inches thick, found in many places in the eastern part of the county. The coal is lying near the surface, but is not mined, except for neighborhood consumption. Kansas City being situated in this county, there are of course a considerable number of manufacturing establishments located within its borders. There are also a large number of steam-flouring-mills distributed all over the county, and also saw-mills, plow shops, etc.

The county had, in 1870, 195,134 acres of improved land; 70,914 acres of woodland, besides 13,385 acres of other unimproved land. Good improved lands are held from $25 to $50 per acre; near Kansas City, from $100 to $1,000 per acre; good unimproved timber can be bought at prices ranging from $8 to $25 per acre; good prairie, somewhat higher.

The leading occupation of the 55,041 inhabitants (exclusive of 32,260 citizens of Kansas City), is agriculture, and the staples are wheat, corn, oats, hay, rye, tobacco, barley, hemp, etc. There is scarcely anything in the vegetable kingdom suited to this latitude that does not find a congenial soil in this county. Wheat is the only grain exported to any extent. Corn, oats and hay are fed to stock, paying best in this way.

The breadth of land devoted to tame grasses is being, annually, largely increased, since farmers now do not so much depend on the "range" as before the war. All tame grasses succeed admirably, and blue grass finds its home here, steadily taking the place of the coarser wild grasses.

Very much attention has been paid in Jackson county to the improvement of all the different kinds of stock. Great numbers of neat cattle, fat hogs, sheep, mules and horses, are raised for market. Sheep-raising could certainly be made quite profitable, the county being well adapted to sheep-husbandry, but a great many dogs are raised at the same time, and the raising of both sheep and dogs in the same neighborhood does not seem to pay.

The rail fence is mostly in use, but also a good deal of plank, stone and the so-called "rough-and-ready" fence. Osage orange hedges have been planted with gratifying success.

Extensive orchards are found in this county, producing excellent qualities of fruits of all kinds. Much attention has also been paid to the raising of grapes, which succeed very well.

The county is extremely well supplied with railroads, which, with the Missouri river, furnish all the necessary facilities for transportation.

A heavy immigration came to this county, which is rapidly filling up with an industrious class of citizens.

The public schools (see table) are well organized, and have mostly able teachers; the city schools, organized under the "special act," are an honor to any county, and some of them second to none in the State.

JASPER COUNTY.

This county is in the southwestern part of the State, and bounded on the west by the State of Kansas; it was organized January 29, 1841.

The surface of the county is undulating prairie, but hilly and heavily timbered in the southern part, which abounds in minerals. About one-third of the area was originally covered with fine forests, but it is now gradually changing to prairie, and the timber land is now found mostly bordering the margins of the water-courses. About one seventh of the whole area is bottom land, with a black alluvial deposit of great fertility. The prairies also contain excellent soil, unsurpassed in fertility, of a black or red color. and also the most valuable of all soils, the "mulatto."

The county is well watered by many beautiful creeks and streams, but chiefly by the Spring river, which meanders through the county, dividing it in two almost equal parts, and its many tributaries, all fed by springs with water as clear as crystal.

There is yet sufficient timber within that county for all agricultural purposes, and of excellent quality.

The climate is excellent, without extremes of heat or cold, with mild winters, and is very healthy.

The mineral resources of this county may well be called inexhaustible. Lead already obtained by the Indians formerly occupying this county, is found in immense quantities. Clipping from last years unpublished reports, Mr. Conrad remarks: "The young city of Joplin, in the southwest corner of the county, looming up from the vacant prairie of two years ago, now putting on city airs, with its army of miners, its array of smelters, its 5,000 citizens, explain why it has become "The Wonder of the West."

The amount of pig lead exported from this city alone is estimated at eighteen million pounds for the year 1873.

Next in mineral wealth is the lately incorporated town of Oronogo (Ore-or-no-go), formerly known as Minersville, now a station on the Memphis, Carthage and North western Railroad, ten miles west of Carthage.

Zinc ores are also found in large quantities, and an abundance of coal exists in the north part of the county.

The manufacturing establishments are principally the lead furnaces, flouring-mills, saw-mills, etc.

The census of 1870 gives 81,266 acres of improved land, 50,909 acres of woodland, besides 56,012 acres of other unimproved land. The average price for improved bottom land is from $25 to $30 per acre; of upland, $20 to $28 per acre; of unimproved bottom land, $10 to $13 per acre, and of upland, $8 to $12 per acre. The cheapest fair prairie is valued at $6 to $7 per acre. The price of land has advanced about 300 per cent. since the war.

The leading occupation of the 14,928 inhabitants (census 1870) is mining and agriculture.

Wheat, corn, oats, potatoes, cotton and hay are the principal productions, and all yield a fair average crop. On account of the wonderful increase of the population in the towns, little, if any, is exported, except cotton, the crop of which is considered more remunerative than corn.

Blue grass, timothy and other grasses succeed very well, and the soil and climate seems particularly well adapted to the growth of the former.

Considerable numbers of stock of all kinds are fed for market, and much attention has been paid to the introduction of blooded stock, and quite successfully. A stock law seems not to be wanted, it having failed by a strong majority.

Fences of all kinds are in use, but principally the rail fence and Osage orange; the latter decidedly a success.

The county has many orchards, mostly planted since the war, and fruit of all kinds, principally apples, do well, and will form quite an item for export.

Wild grapes of excellent quality are found everywhere in great abundance, proving beyond doubt that the county is well adapted to viticulture.

The railroad facilities are excellent; the M. C. and N. S.W. R. R. has a track of 36 miles, running from southeast to northwest, connecting on the east with the A. and P. R. R., and on the west with the M. R. F. S. and Gulf R. R. The population of this county has been very rapidly increased in the last years, as has already been mentioned.

The schools in this county (see table) are in a flourishing condition, and the pride of the people, who are certainly not lagging in educational matters.

JEFFERSON COUNTY.

This county is situated on the Mississippi river, in the eastern part of the State, and was formed from parts of St. Louis and Ste. Genevieve, December 8, 1818. The general surface of the county is broken and hilly, and some of the highest ridges attain an elevation of nearly 500 feet above the level of the Mississippi river. Some of the ridges are very narrow, separated by deep ravines, but often rise by a succession of terraces to the general level of the plateau.

The soil along the creeks is a rich alluvial, embracing about one-third of the whole area, and producing very large yields of corn.

The uplands, though not nearly as rich, yield fine crops of wheat, and cannot be surpassed for fruit-growing and viticulture. These highlands are rolling and well timbered with the different kinds of oaks, hickory, walnut, ash, and other species of trees generally found in Missouri, furnishing the necessary timber for all practical purposes.

The county has several large rivers, such as the Meramec, on the northern boundary; Big river, in the western part; Joachim, in the central, and the Platin, in the eastern part of the county, which, with their numerous affluents, furnish all the necessary water and considerable water-power. Springs of pure water also abound, and some contain medicinal properties.

The scenery in some parts of the county is sublime, and principally near the "Father of Waters," and very picturesque sites for private residences are found along the track of the railroad.

The mineral resources, although not extensively developed, are very promising, consisting chiefly of iron, copper, zinc and lead; the latter is the great mineral product, and is quite extensively mined and smelted, there being quite a number of mines in operation, and they are particularly numerous in the southwestern part of the county. Limestone and excellent sand for glass abounds. Besides the lead mines and furnaces, the county can boast of about ten flouring-mills; one cheese factory; plate glass, and agricultural implement manufactory, etc.

The county had, in 1870, 70,361 acres of improved land; 193,487 acres of woodland, besides 2,773 acres of other unimproved land. The price of land differs very much according to location, quality, etc.; but the average price of improved farms may be said to be about $25 to $30 per acre, and of unimproved land, about $5 per acre.

Agriculture is the leading occupation of the inhabitants, which numbered in 1870, (census,) 15,380. The leading agricultural staples are corn, wheat, oats, hay and potatoes, which all yield abundantly.

Stock of all kinds is raised in considerable numbers for market, and some improved breeds have been successfully introduced.

There are but few pastures of tame grass in the county, the inclosing and improving of pastures being a "Yankee notion," and does not take well. Blue grass is natural to the soil, and is working steadily but surely into inclosed lands.

A stock law is wanted, and will in due time be secured, if "more light" is obtained.

As already mentioned, the county is peculiarly well adapted to fruit-raising and viticulture. Apples and peaches seldom fail to produce a very large yield. Grape-growing and wine-making is already a large industry, there being at least 700 acres devoted to this purpose, and the area is rapidly increasing.

The Mississippi river and the St. L. & T. M. R. R., the latter traversing the county from northeast to southwest, and the M. P. R. R. in the northwestern corner, afford excellent facilities to the market, which is St. Louis.

Since the war there has been quite an influx of immigration from all parts of the United States and Europe, but principally farmers and mechanics from the Eastern and Middle States.

Considerable improvement has been wrought in the public schools of this county, and it has a sufficient number of good school houses in most or all sub-districts. (See table.) There is also one seminary at DeSoto, built in 1860.

JOHNSON COUNTY.

This is one of the largest counties in central western Missouri, and was organized December 13, 1834. Its surface is mostly a rolling prairie in the western part, and hilly in the eastern part, where there is an extensive growth of young timber. About four-fifths of the area is prairie, the rest timberland. Timber is still abundant, increasing just as rapidly as used, so that there will be an adequate supply for all future demands.

The soil throughout the entire county is very rich and productive, being for the greater part limestone soil, except near Warrensburg and vicinity. The prairie soil is well adapted to the growing of cereals and grasses of all kinds. The soil on the uplands is also very good, and when cleared and put under cultivation produces well.

The county is well watered by many large and small creeks, furnishing all the necessary water, but only very little water-power.

The Columbus mineral springs, well known on account of the great medicinal properties they possess, are located in this county, and many invalids derive benefits from their curative properties.

The climate is uniform with that of other sections of the State in the same latitude, that is not subject to very great extremes of heat and cold.

The principal mineral found is bituminous coal, which is abundant in almost every part of the county; cannel coal of good quality occurs in great quantity in the north central part of the county. The great coalfields of the county, however, lie in the eastern part, near Knob Noster, and some of the mines have been worked on an extensive scale; large quantities have been taken out. Ochre of good quality occurs also. A fine quality of cement rock is found south of Warrensburg, from which cement fully equal to the famous Louisville cement is manufactured.

The Warrensburg sandstone, of which there are large quarries near the town of Warrensburg, are becoming each year more and more celebrated and valuable. Large quantities of this stone is being shipped to St. Louis and other cities for building purpeses. These quarries seems to be inexhaustible.

The manufacturing interest of this county is as yet in its infancy. There are ten flouring-mills, five of which are first-class; one woolen-mill and cloth factory; one foundry and machine-shop; three agricultural implement manufactories, and the cement works alluded to.

The county had, in 1870, 197,491 acres of improved land; 108,712 acres of woodland; and 80,784 acres of other unimproved land. The average price of improved land is from $20 to $25 per acre; and unimproved prairie, $10 to $12 per acre; and of timber and bottom land, $7 to $12 per acre.

The leading occupation of the 24,648 inhabitants (1870) is agriculture. The principal agricultural staples are wheat, corn, oats, rye, barley, horses, mules, hogs, cattle and sheep. They are sold to home dealers, who sell them in St. Louis and Chicago markets. A large quantity of flour is made for foreign markets, and is shipped to Kansas City, St. Louis, and intermediate points.

The usual average yield of corn is about 40 bushels; of wheat, 15 bushels; and of oats, 25 bushels per acre. On account of the general drouth prevailing in 1874 through the whole State of Missouri, the yield for that year is below the average. The soil is well adapted to the growth of tobacco, but very little is raised. Other vegetables and cereals are successfully grown for home consumption.

Timothy and blue-grass are grown extensively for pasturage, the latter taking rapidly the place of the wild grass on the commons. This county ranks first in the State as a stock-growing county, having a larger number of cattle than any other county, and only St. Louis has more horses. Great numbers of live stock are annually raised for market, and considerable improvements have been made in the kind of animals. Comparatively few sheep are raised. A stock law seems not to be wanted, as it was defeated.

Rail fences are mostly in use, costing about $1 per rod. Hedges are cultivated to a great extent, and very successfully.

Johnson county is decidedly a fruit-growing county, and a large quantity of excellent fruit is grown for market. Grapes also do well, and are quite extensively cultivated.

The facilities for transportation are the M. P. R. R., running through the center of the county from east to west, and the M. K. & T. R. R., in the western part of the county. St. Louis and Kansas City are the principal markets, the former for produce and the latter for fruit, which goes mostly to the territories.

The immigration since the war has been considerable from the Eastern and Northern States, generally of an enterprising, laboring class, with limited means. No county in the State presents greater advantages to those in search of new homes; the price of land is reasonable, the rich soil well adapted to farming, and there are good schools.

The educational interests of the county is steadily increasing, and it has now better schools and more efficient teachers than formerly. The Second District State Normal School, located at Warrensburg, is in successful operation.

KNOX COUNTY.

This county is situated in the northeastern part of Missouri, and was organized February 14, 1845.

The general surface of the county is undulating, with many bottoms along the rivers. About three-fifths of its area are small, rolling prairies, none larger than from three to four miles wide.

The soil is a rich loam, underlaid with a strong, yellowish clay.

The many water-courses are skirted with timber, sometimes very large bodies; but in many parts the bottoms are destitute of timber, and are covered with a luxuriant growth of wild grasses. The leading varieties of timber are oaks, elm, walnut, hickory, maple, etc., and there is yet enough for all present and future demands.

The timberless bottom lands are very fertile, and produce large crops, if not too much subject to inundation.

The Fabius river, flowing in a southeasterly direction, is the principal water-course, and affords, with its many tributaries, all the necessary water for stock, and some good water-power.

No minerals, of any consequence, have been thus far discovered.

The manufacturing interests are but poorly developed. Beside a few grist and saw mills, there is one cheese factory, and a small factory for the manufacturing of farming implements.

The county had, in 1870, 154,710 acres of improved land; 86,098 acres of woodland, beside 37,109 acres of other unimproved land. The prices of both improved and unimproved lands are low.

The population, 10,974 in 1870, is chiefly employed with agriculture.

The leading staples are the same as in the surrounding counties, and yield large crops.

As a blue grass country, this county compares favorably with others. The blue grass is found growing "spontaneously," and soon chokes out the original prairie grass.

The county has an abundance of excellent grazing land, and is therefore well adapted to stock-raising and the dairy business; and there being quite an area of fine ranges, the farmers are generally not in favor of a stock law.

Improved breeds of stock are being introduced successfully, but as yet to a limited extent.

The fences mostly used are the rail and plank fences, and the Osage orange hedge; the latter of which gives a most gratifying result.

Farmers are also well pleased with their success in raising all kinds of fruit peculiar to this latitude, and numerous orchards are found scattered over the county. Viticulture is also cultivated to some extent, mostly by Germans, and with pleasing success.

The county has good facilities for the transportation of its surplus produce, and its fine beef cattle, hogs, etc.

The leading markets are Chicago and St. Louis.

The Q. M. & P. R. R. runs through the county from east to west, and the K. and K. C. R. R. will also soon be completed.

The county has received a fair and steady influx of immigration since the war, mostly Irish, Germans, and a slight admixture of settlers from the Eastern and Middle States—generally a very sober and industrious class.

The county is well supplied with public schools, as can be seen by the annexed table, and much interest is taken by the citizens in educational matters. The St. Joseph Academy is the only incorporated institution in the county.

LACLEDE COUNTY.

Laclede county is one of the counties forming the so-called Southwest Missouri. It was formed in 1849, and named in honor of the founder of St. Louis, Pierre Laclede. The county is situated on the high table-lands of the Ozark range, about 2000 feet above the level of the sea, and necessarily possesses a pure and healthy atmosphere.

The surface of the county is varied from the level and gently undulating prairies and table-lands to the rugged hills along the water-courses. The most prominent among the latter are the Gasconade river in the east, the Big Niangua river in the west, and the Ozark fork of the Gasconade river in the south. These rivers afford an immense, yet unimproved water-power, and abound in excellent fish.

The bottom lands along these streams, and the great number of creeks, which meander through this county, is unsurpassed for fertility, and hardly ever fail to produce good crops, even in such a dry season as 1874, if properly cultivated.

Notwithstanding the great drain upon the timber for railroad ties for the last few years for western railroads, it is still abundant, and with the rapidly growing second-growth, will be adequate to all reasonable future demands of the present generation.

Brown hematite iron ore has been found in several places, and also lead and zinc, but owing to the lack of capital no mines have been developed.

There are five grist and three saw-mills in the county, doing a thriving business. A woolen-factory is much needed and would be very profitable, there being such an immense water-power; for instance: there is a spring rising in Dallas county, which, from a single outlet flows 126 cubic feet of water per second by actual measurement.

In 1870 there were 31,091 acres of improved land; 864 acres of unimproved land, and 88,931 acres of woodland. The prices of improved lands range from $5 to $40 per acre; unimproved lands from $1.25 to $20 per acre. The price of lands in this county, as all over Missouri, has been steadily declining for the same reasons already mentioned in other counties.

The occupation of the 9,380 inhabitants, (census 1870,) is chiefly agriculture. The leading products are wheat, corn, oats, rye and potatoes. Other fruits and cereals, timothy, clover and blue grass succeed admirably. The average yield of corn for bottom lands is from 40 to 50 bushels per acre; for uplands 25 to 35 per acre; and of wheat, 15 bushels per acre, (last year 18 to 20 bushels.)

The principal exports are wheat, tobacco and live stock.

The raising of stock is quite profitable, and improved breeds are rapidly increasing in numbers.

About 99 per cent. of the farmers are opposed to the stock law as at present. Timber being so abundant, fences can be made at so little cost, that there is no necessity for such a law.

The climate and soil being so well adapted to fruit-raising, that at not a very distant time, Laclede county will rank with the foremost fruit-growing counties in the State. Viticulture is carried on to a limited extent, but preparations are made to engage more extensively in it.

The facilities for transportation are at present confined to the A. & P. R. R., which traverses this county for a distance of upwards of 40 miles. If the Osage river is improved, the county would have regular river transportation within 20 miles.

About two-thirds of the present population have come to this county since the war, and there is still plenty of room for many more.

The educational interests of the county are steadily advancing, and good school-houses, some with very able teachers, are found everywhere. (See table.) There is also a high school at Lebanon.

LAFAYETTE COUNTY.

This county is situated in the western part of the State, bounded on the north by the Missouri river, and was organized November 16, 1820, from part of Cooper county. This county has long been noted for the richness of its soil, the abundance of its water, the excellence of its climate, and the wealth and refinement of its citizens. Its general surface is high and rolling, about three-fourths prairie and one-fourth timber. A high ridge passes south of its centre, separating the tributaries of the Missouri from those of the LaMine. The county is well watered by many streams, affording an abundance for general purposes, but only limited water-power. Along these streams are found fine groves of timber, such as walnut, oaks, hickory, elms, ash, hackberry, cottonwood, etc., with an undergrowth of hazlenut, pawpaw, grapes, etc., and timber is still abundant for all practical purposes, only about one-quarter of the large timber having been cleared off during the last twenty years.

The soil is a light, rich, sandy loam, mostly underlaid with limestone. The bottoms of the river are unsurpassed by any agricultural section in the State, and in fact in the United States, for their productiveness.

Coal is abundant in nearly every part of the county, and especially so in all the river bluffs; it is of good quality, averaging about 22 inches in thickness, and is mined at Lexington to supply the railroads and river navigation, and also conveyed by railroad to other points.

The manufacturing interests embrace two founderies and machine shops, flouring, planing and saw-mills, wagon and carriage shops, hemp and furniture factories, etc.

The county had, in 1870, 166,608 acres of improved land; 75,839 acres of woodland, besides 33,236 acres of other unimproved land. The average price of improved land is about $20 per acre; of unimproved, from $10 to $12 per acre. Good timberland, both on the upland and on the bottom, is worth about $20 per acre. The leading occupation of the 22,623 inhabitants (census 1870), is agriculture, and the leading staples are corn, wheat, barley, rye, oats, tobacco, hemp and hay. The commodities for export are mainly wheat, tobacco, hemp, cattle and hogs. The average yield of the cereals and vegetables compares favorably with most of the other counties.

Blue grass grows luxuriantly, and is used for pasturage.

Much attention has been paid to stock-raising, and to the introduction of improved animals, especially hogs, cattle and horses. The county is well adapted to this branch of agriculture; the climate is not subject to such great extremes as in other localities; the winters are generally mild, so that some farmers, who have inclosed pastures, graze their cattle on the prairies until about December, and then winter them in the pastures, with but little feeding or protection. A stock law is desired and greatly needed by a majority of farmers in some districts.

Rail fence is mostly used, costing not very much on account of abundant timber.

The county is exceedingly well adapted to the raising of all kinds of fruit, and orchards are abundant throughout it, producing large yields of fine fruit; the county is destined to be one of the leading fruit-growing counties in the State. The same may be said of grapes, though they are, as yet, not cultivated to any great extent.

The principal market for this county is St. Louis. The facilities for transportation are very good; besides the Missouri river, there is the Lexington branch of the M. P.

R. R. extending 27½ miles diagonally through the county, the North Mo. Railroad to Lexington, on the north side of the river; the Lexington and St. Jo. R. R. completed, and the B. & S. W. R. R. is graded in a southwesterly direction from Lexington.

The influx of immigration has not been very large, and there is yet much room to spare for industrious farmers to settle upon and take advantage of the present low prices of the fertile land.

The public school system is now more popular than ever before, and the county has now, besides three seminaries for young ladies, and several smaller private schools, many fine public schools and very able teachers.

LAWRENCE COUNTY.

This county is situated in the southwestern part of the State, and was organized from parts of Dade and Barry, December 25, 1845. This county lies on the table-lands of the Ozark mountains, about 1,300 feet above the level of the sea. It is about equally divided in prairie and timberland, the former level or gently undulating and well drained, and the latter more broken. The northeastern part of the county is hilly and densely timbered, while the timber in the remainder is well distributed, skirting the many streams, which afford all the necessary water for stock and farm use.

The county is also well supplied with many fine springs, some of which afford good water-power, as well as some of the larger streams, which, however, are generally shallow, with solid fords, so that no bridging is needed.

About one-half of the surface of the county is bottom, the rest upland. The soil, from two to three feet in depth, is mulatto on the prairies, a rich alluvial deposit in the bottom, and some of the high, dividing ridges are dry, with a rather inferior soil, and sometimes quite rocky.

The county has an abundant supply of timber for fire-wood and fencing, but the timber for building and rails is getting scarce, though the rapidly growing young timber promises to supply all the future demands for that purpose.

There are numerous indications of iron and lead, but none have been as yet developed, to show whether they occur in sufficient quantities to pay.

The manufacturing interests are a number of flouring-mills, running both by steam and water-power; a machine shop; several saw-mills; wagon-shops, and one distillery.

The census of 1870 gives 85,283 acres of improved land; 70,627 acres of woodland, besides 18,396 acres of other unimproved land.

Improved farms vary in price from $10 to $30 per acre; and unimproved land from $5 to $10 per acre.

The leading occupation of the 13,067 inhabitants, is agriculture, and the principal staples are corn, wheat, oats, hay, fruit, tobacco, etc., all of which grow well.

The exports are mainly wheat, corn, cattle, horses, mules, hogs, tobacco and hides. Tobacco and cotton both grow well, but are comparatively but little cultivated.

All the tame grasses succeed well for pasturage and hay.

Some attention has been paid to the improvement of stock, principally cattle and hogs, which have been successfully imported from Kentucky. The raising of sheep is quite profitable; they are not subject to disease, nor are wolves and dogs so very injurious as in other counties.

Rail and plank fences are chiefly in use, costing about seventy-five cents per rod for first cost. Osage orange hedges are also successfully raised.

A stock law seems not to be wanted by a majority of the farmers.

Fruit-culture is the best business, and great quantities are raised annually. Some farmers raise as high as 2,000 bushels of apples, and other fruit in proportion, always finding a ready market.

Grapes do well, but are as yet little raised.

The facilities for transportation are good. The A. & P. R. R. has about 23 miles of track passing from east to west through the southern part, and the M., C. & N. W. R. R. has three miles of track in the southwestern part of the county. Southern Kansas and St. Louis are the principal markets.

A great influx of immigration found its way to this county since the war, and more is wanted to cultivate the unoccupied fertile lands.

This county is well supplied with public schools, (see table,) and has a great number of excellent teachers, and most every sub-district has good school houses.

LEWIS COUNTY.

This county, situated in the northeastern part of the State, bounded on the east by the Mississippi river, was organized in 1832.

The general surface of the county is undulating, well diversified; about one-half of it being well timbered, and the other half being fine upland prairies. Along the whole river front, some twenty-five miles, is a rich, wide, alluvial bottom, with excellent soil and very deep. The upland prairies have a black, rich and friable soil of from 12 to 24 inches in depth. The bluff land, along the Mississippi river, is excellent for the cultivation of fruit and grapes.

The county is well drained by several rivers beside the "Father of Waters." The principal ones are the South, Middle and North Fabius, and the Wyaconda rivers, which give plenty of water for stock, and also water-power for milling and other purposes. The bottom land, along these streams and their many tributaries, are also very rich, yielding large returns.

The timber of the bottom lands is chiefly ash, elm, hickory, maple, and on the uplands, oaks, hickory, walnut, etc.

Coal of good quality has been discovered in several portions of the county, but has not been developed, and is not mined.

Limestone of excellent quality, standing well the frosts of winter, is quarried.

The climate is good and healthy.

The county possesses a fair supply of manufacturing establishments, consisting of a rolling-mill, located at LaGrange, and employing about 500 operatives; saw and grist-mills; one merchant flouring-mill; a furniture and a tobacco factory, and wagon, plow, harness and saddle shops.

The county had, in 1870, 138,126 acres of improved land; 108,970 acres of woodland, and 15,258 acres of other unimproved land.

The price of land varies considerably, according to location, quality of soil, kind and extent of improvements, etc., but is quite low.

The leading occupation of the 15,114 inhabitants (census 1870), is agriculture.

The principal productions are corn, oats, wheat and timothy hay, with cattle, hogs, horses and mules.

Nearly all the timberland is very well adapted to the growth of wheat and tobacco. On the Mississippi bottom, 100 bushels of corn are often produced in favorable seasons. Considerable attention has been paid to the culture of timothy for hay, and many thousand tons are annually sent to the market at St. Louis. Blue grass is found growing wild everywhere, and is highly prized for winter pasture, but is becoming troublesome in timothy meadows, crowding it slowly out.

Much attention has been paid to the improvement of the native stock, and with good results, the county being well adapted to stock-raising. Great numbers of stock of all kinds are sold annually.

Fruit is not grown as a market crop thus far, but there soon will be more produced in the county than is wanted for home use; the county is classed among the best fruit-growing counties of the State. Grapes are growing rapidly in favor among the farmers, and considerable quantities of the finest fruit is shipped, and many gallons of wine are manufactured. The smaller fruits do also very well, and are raised to some extent.

The county has two railroads in operation, the M., V. & W. R. R. (23 miles), and the G., M. & P. R. R. (27 miles); the former passing through the county along the bank of the Mississippi river from north to south, and the latter crosses the southern part of the county from east to west.

The county is furnished with ample school houses and good teachers, much interest being manifested in educational matters by the citizens.

LINCOLN COUNTY.

This county is situated in the eastern part of the State, bounded on the east by the Mississippi river, and about 60 miles above St. Louis.. It was organizd from a part of St. Charles, December 14, 1818. The general surface of this county is gently rolling; about one-third is prairie, and the rest timberland.

The soil is very productive, of a great depth, and especially so in the bottoms. Besides the above mentioned river, the county is well watered by many rivers and creeks, affording abundant water for all purposes. The principal river is the North and West Cuivre, uniting near the center of the county, and flowing in a southeasterly direction, into the Mississippi river.

Timber is very abundant for all practical purposes, and of good quality, well adapted to all manufacturing purposes, and there will be no lack for future demands.

Coal strata, of immense thickness, sometimes 20 feet, and of a good quality, underlie many square miles of the county, and are worked to some extent.

Iron has also been found, but is not worked.

White sand of great purity and freedom from minerals, excellent for the manufacturing of glass, also abounds in the central part of the county; and also blue and white limestone of good quality.

The manufacturing interests of this county comprise some steam-flouring and saw-mills, plow-shops, and one large tannery, employing about 30 operatives.

The county had, in 1870, 135,423 acres of improved land; 156,110 acres of woodland; besides 8,097 acres of other unimproved land. The prices of land are quite low, since but little immigration found its way to this county on their westward march.

The leading occupation of the 15,114 inhabitants, (census 1870,) is agriculture.

The principal staples are wheat, corn, oats, hay, etc.; and the commodities for export, are hogs, cattle, mules, wheat, tobacco, etc. Considerable interest has been taken in the improvement of stock of all kinds, principally in cattle and hogs, so that the old native "scrub" stock is rapidly disappearing.

Fruit of all kinds is grown to some extent, and is doing finely, and the average of orchards is rapidly increasing. Grape-vines also succeed well.

The county has excellent facilities of transportation to markets, both by river and railroads.

Educational progress has been quite rapid in some districts of the county, but less so in others. Good school houses and teachers are found, and people manifest considerable interest in these public schools.

LINN COUNTY.

Linn county is situated in the northern part of the State, and was organized from Chariton, January 7, 1837. The surface of this county, as approached from the east, consists of alternate prairie and timber, stretching away to the north and south. About three-fourths of the county is prairie, and the rest timber. The soil is mostly very productive.

The county is well watered by many fine streams, flowing from north to south, which afford good water-power, and are all skirted by timber, of good quality, consisting principally of the different kinds of oaks, walnut, hickory, elm, cottonwood, etc. The timber on Locust creek is the most abundant. Along the streams very fertile bottoms are found, which become more valuable every year, as they become less swampy. Formerly small branches, now tributary to the larger streams, spread over the bottoms, forming large swamps, which are now arable, caused by the tramping out and eating off of the swamp grass by numerous herds and flocks, and thus allowing the branches to cut themselves channels to the main creeks.

The mineral resources are coal, mineral paints, fine clay of different kinds, and excellent building stone. The former has been mined to some extent, both by sinking shafts and drifting.

The manufacturing interests consist of flouring-mills, woolen and tobacco factory, plow, wagon and stoneware manufactories, etc.

The census of 1870 gives 103,120 acres of improved land; 66,398 acres of woodland; besides 59,627 acres of other unimproved land.

The H. & St. J. R. R. has several thousand acres of good prairie land for sale, principally located in the north central part of the county. The prices of land are quite low.

Google

The leading occupation of the 15,900 inhabitants is agriculture, and the principal staples are wheat, corn, oats, tobacco and potatoes, of which corn, wheat and tobacco are chiefly exported, besides a large number of fat hogs, neat cattle, sheep, horses and mules. Much attention is being paid to stock-raising, to which the county is well adapted, having yet an abundance of good ranges. The same may be said of the cultivation of fruits.

The county has good facilities for transporting their neat stock and surplus produce to market, having three different railroads traversing the county.

A considerable influx of immigration found its way to this county, principally industrious farmers.

Most of the schools are in a prosperous condition, and the cause of education is progressing; the larger towns have fine school houses.

LIVINGSTON COUNTY

This county is situated in the northern part of the State, and was organized in 1837. The surface of the county is about equally divided into timber and prairie. The prairies are generally rolling upland, rich and fertile, well adapted to farming and grazing purposes, and excellent for the growth of the cereals, tobacco, hemp, and fruits of all kinds But little broken land is found, mostly in the western part, on the south side of the west fork of Grand river, where some of the hills attain an elevation of 200 and more feet.

The county is more than ordinarily watered, chiefly by Grand river and its numerous tributaries, which afford the necessary water for all purposes. This river flows diagonally through the county, from northwest to southeast. The bottoms on most of these streams are very fertile.

The soil is mostly dark and rich, from one to two feet in depth, except in the broken parts, where it is sandy, light brown, not deep, but well adapted to fruit-raising.

Timber is still abundant, being most abundant between the eastern and western forks of Grand river, and of good quality. Most of the streams are also skirted by groves of timber common to this latitude. The supply of timber will, with proper care, remain ample for all future legitimate demands.

Coal is found to some extent in various localities, and has been worked, but only for local consumption. Indications of copper and iron are occasionally met with, and mineral paint of good quality is also found.

Building-stone abounds, and also a good fire-clay.

The county had, in 1870, 94,918 acres of improved land; 59,911 acres of woodland, besides 49,890 acres of other unimproved land.

The average price of improved land varies, according to locality and quality, from $8 to $25 per acre; unimproved upland, from $8 to $15 per acre; timberland about the same, and prairie bottom land, from $5 to $7 per acre.

The county is well supplied with flouring-mills (eight), most of them of a superior grade for country mills, and furnishing ample and convenient accommodation for all citizens. Besides these, there is a small foundry and machine-shop; several wagon and plow-shops; a tobacco manufactory; a planing-mill and a brewery.

The leading occupation of the 16,780 inhabitants (census 1870), is agriculture, and wheat, corn, oats and potatoes are the principal productions. Tobacco is grown to a moderate extent, and is a profitable crop. All the different kinds of cereals and vegetables produce large yields, and large quanties of wheat and corn, and also tobacco, are shipped to market.

Pasture of tame grasses do very well, and especially the blue grass, which is invading the country, and steadily taking the place of the native grasses.

Very considerable attention has been paid to the improvement of stock, and principally of hogs, so that the old "hazel-splitters," or "ditch snipe," are seldom seen, and all who have imported blooded stock have had good success, and find a ready sale for all surplus stock.

The county is well adapted to the raising of sheep, and many large flocks of sheep, principally improved with Merinoes, are found in it.

The old worm rail fence is mostly in use, and rails of hard wood can be obtained in place at from $3 to $4 per hundred. Plank fences are also much used, and hedges are raised with success.

A stock law is wanted by most of the intelligent farmers.

The rolling timberlands are well adapted to fruit-raising, and all who engage in it meet with good success; the same can be said of the grape.

The facilities for transportation are good, the county having 58 miles of railroad, namely: 27 miles of the H. and St. Jos. R. R., and 21 miles of the St. L. K. C. & N. R. R. A third road is graded. The principal markets are Kansas City, St. Louis and Chicago; the latter city is leading in stock.

Immigration has poured in rapidly since the close of the war, principally from the eastern and northern States, and belonging mostly to the class of small farmers, but within the last three years has largely decreased.

The schools in this county (see table), are in a flourishing condition.

MACON COUNTY.

This county, organized in 1838, is situated in the northern part of Missouri, on the great divide, separating the waters of the Missouri and Mississippi rivers. About two-thirds of it is covered with timber, the balance is prairie. The surface is gently rolling, with hills adjacent to the water-courses.

The soil is mostly clay, mixed with sand, and a black loam in the fertile bottom lands on the Chariton river, which are about two and a half miles in width; other bottom lands on the middle and east fork are about one-half mile wide.

The water-courses are the Grand Chariton and its tributaries, which afford all the necessary stock water, and also some water-power for manufacturing purposes.

Timber is abundant for fencing, building and other purposes, and will last a long time yet.

Bituminous coal is the only mineral found, and thousands of acres are underlaid with it, cropping out in many places. It is mined in 4 or 5 places, employing some 400 hands.

The climate is mild, and as healthy as any other county of Missouri.

There are four flouring mills; one foundry, and one large wagon-factory in the county.

The census of 1870 gives 140,087 acres of improved land; 110,096 acres of woodland, and 65,073 acres of other unimproved land. The average price of improved land is $15 per acre; of unimproved, about $8 per acre, and bottom or swamp land sells from $2 to $8 per acre. The price is about the same now as it has been since the close of the war.

The 23,230 inhabitants are principally occupied with agriculture.

Corn, wheat, oats, grass and tobacco are chiefly raised. Tobacco forms the article for export, and is raised to some extent, about 2,000,000 pounds last year.

The crops of 1874 have not been as good as in other years. Other crops also succeed well, and are raised for home use.

Blue grass, timothy, red top and red clover, when properly tried, are a success.

Improved stock has been imported, and the standard of the live stock of this county is rapidly improving.

A minority of the farmers want a stock law.

The worm, post and rail fences are mostly in use, costing from $300 to $400 per mile, according to kind of fence and convenience of material. Osage orange hedges do excellent on dry lands.

Apples, peaches, pears and the smaller fruits are successfully raised, and fruit-raising being profitable, and the county well adapted to it, will soon make Macon a leading fruit-growing county.

A considerable number of acres have been planted to grapes, which seem to be perfectly at home in the timbered districts.

The H. & St. Jos. R. R. and the N. M. R. R., furnish the means of transportation to markets.

There has been some immigration from the east and from Europe to this county since the war, mostly of the latter class.

The public schools are in a flourishing and prosperous condition (see table), and there are two colleges and one seminary in this county.

MADISON COUNTY.

This county is situated in the southeastern part of the State, about 100 miles south of St. Louis, and about 30 miles west of the Mississippi river. It was organized from portions of Ste. Genevieve and Cape Girardeau, December 14, 1818.

The surface is very rough and broken, with granite and porphyry hills, some of which rise to a height of 700 feet above the level of the St. Francis river.

The bottom lands along the rivers and creeks are of an excellent quality, and there are also large bodies of upland, or "flat woods" which are well adapted to cereals and fruit.

The county is very well watered, the Big St. Francis river on the west and Castor river on the east side of the county, extend entirely through it, both running in a southerly direction, and their numerous tributaries meander through it in every direction, while a multitude of clear springs gush out from the hillsides. The larger streams afford excellent water-power, as yet unimproved.

The county is well timbered, not having any prairie within its borders; the timber consists principally of oaks, yellow pine, walnut, hackberry, etc., enough for all future demands.

The soil along the valleys of the streams is generally sandy and gravelly, yet very productive.

But few sections of country of the same size contain more minerals, and of a greater variety, and some of them in large quantities. The well known "La Motte Lead Mines," worked as early as 1722, have produced annually, since 1830, over 1,000,000 pounds. Gold, silver, nickel, copper, bismuth, antimony, zinc, lead, mangonese, iron, arsenic and cobalt are found in the land of the La Motte Lead Company. Lead and iron are inexhaustible, and are found in nearly every section in the county, as well as copper and the largest and richest deposit of nickel and cobalt known in the world are found in this county. A very great amount of iron, lead and nickel are mined, the latter used for coining our small money. Kaolin, fire clay, sandstone, limestone, grind and burr stone, yellow and red ochre, sulphur, silex, fluor-spar, etc., also abound.

Lead smelting furnaces and several flour and grist-mills, comprise the manufacturing establishments of this county.

The census of 1870 gives 18,298 acres of improved land; 62,839 acres of woodland, besides 1,790 acres of other unimproved land. The price of land is very variable, according to location, quality, etc., but is very low.

The leading occupation of the 5,849 inhabitants (census of 1870) is mining and agriculture. The leading agricultural productions are corn, oats, wheat and stock, but not in larger quantities than to meet the home demand. The county is extremely well adapted to stock-raising, perhaps better than to any other branch of farming. There are tens of thousands of acres of hill land that will never be inclosed, and which afford an excellent pasturage for more than half the year. Sheep-husbandry could certainly be made very profitable. These hills are also well adapted for fruit-raising, and eminently so for the growth of the luscious grape, which is found growing wild, stretching in graceful curves from tree to tree, covering the branches and yielding annually an abundance of fruit.

The St. L. & T. M. R. R. passes through the northeastern part of the county for a distance of 23 miles, and brings the leading exports, such as lead, pine and oak timber stave timber and railroad ties to market.

A considerable influx of immigration has come to this county, mostly farmers and miners, and there is still plenty of vacant room for both.

The educational interests, though formerly somewhat neglected, are now rapidly improving. (See table.)

MARIES COUNTY.

This county is situated in the central or more southern portion of the State; it was organized March 2, 1855.

The surface of this county presents a great variety of soils; the uplands in the western part is very productive, yielding an abundance of wheat; the more eastern portion is not so productive, but yields fair crops of wheat, oats and grass.

The county is well watered by many streams, principally by the Gasconade river, which very nearly divides the county in equal portions. This river is remarkable for the vast bodies of rich bottoms and dense forests of timber; such bottom lands are also found on the Big and Little Maries. These two streams nearly divide the territory west of the Gasconade river. The county east of that river is also well watered by many streams, and not so broken as the western part.

The county is principally a timberland, there being only two small prairies—the Lanes and Spanish prairies—in the county, the former a beautiful, undulating plain and very productive.

There are vast deposits of iron ores in Maries county, chiefly found around the Lanes prairie and in the western part, where the Crismon and the McCogthlin banks are situated, both great hills of rich ore. There are also some good indications of lead and coal.

In 1870 there were 29,935 acres of improved land; 65,847 acres of woodland, besides 25,789 acres of unimproved lands. The average price of farms varies, according to quality of soil and improvements, from $5 to $20, and of unimproved land from $1.25 to $10 per acre. These low prices are accounted for by several reasons, such as the continued drouth, the Chinch Bug, etc., which have discouraged the farmers, who are offering to sell at a lower figure than the actual cost.

Of the 5,916 inhabitants (1870) the majority are farmers. There being only two flouring-mills, two saw-mills and one woolen factory in this county.

The agricultural products are wheat, corn and oats, of which wheat and oats form the commodities for export. Corn and hay are fed to stock and marketed in this shape. Tobacco is cultivated to some extent for market; other fruit and cereals only for home consumption. There are very few pastures of tame grass; blue grass is growing wild. A stock law seems not to be wanted, though the improvement of stock is hardly possible without such a law. Sheep-raising would be lucrative, if properly pursued. Fruit of all kinds grow excellent, and there are many fine orchards. Grapes are grown on a small scale.

The only facility for transportation is the S. W. B. P. R. R., and St. Louis is the principal market.

Immigration has been very light in the last four or five years.

The educational interests are receiving increased attention, and the county has already a goodly number of schools. (See table.)

MARION COUNTY.

This county is situated on the Mississippi river, in the northeastern part of the State; it was organized December 23, 1826. The eastern portion of the county, bordering on the river, consists of rich bottom lands, extending from one to three miles back to the uplands, and where they merge into them; there is for some 6 or 8 miles west, with now and then a small belt of white oak land, a large area of elm land, equal to any land in the State in point of productiveness, and immediately west of this lies the prairie white oak lands, with numerous rich bottom lands on the rivers and creeks. About one-half of the county is prairie, the other is timber.

The county is traversed by four fine rivers, affording much water-power, and with their tributaries, all the necessary water for farm use.

Timber has been abundant, and is now for ordinary purposes, but will not be so long, without some check to its increasing destruction.

Minerals have not been discovered as yet. Coal is found in one place in quantities to justify mining. Potter's clay of good quality, and marble also occurs.

There are five or six flouring-mills in the county, two of which are important, producing very large quantities of flour; one large foundry and car-shop in Hannibal, and two agricultural implement factories on a small scale.

The county had, in 1870, 99,544 acres of improved land; 104,592 acres of woodland; besides 4,485 acres of unimproved land. The price of land has decreased since the war, owing to the general depression of all business interests. The average price of prairie land is from $5 to $10 per acre; while oak land is sold at about $15 to $20 per acre, and elm land at $40 to $50 per acre.

The leading occupation of the 23,780 inhabitants, (census 1870,) is agriculture.

The staples are corn, wheat, timothy and clover hay, oats and potatoes. The commodities for export are wheat and some hay. The average yield of corn is 40 bushels per acre; of wheat, 20 bushels per acre; of hay, 1½ ton per acre, and of potatoes, 100 to 125 bushels per acre. Tobacco, though it does well on the white oak lands, is very little cultivated. Other vegetables and cereals are successfully grown for home consumption.

Blue grass grows finely, and it is used, to a great extent, for pasturage. It takes hold on all lands which are not cultivated or too thickly overgrown with brush, and farmers are now cutting away the latter to procure excellent blue grass ranges.

The farmers are beginning to appreciate the value of improved breeds of all kinds of stock, and they are being introduced with satisfactory results. Great numbers of live stock are annually raised for market. The county is extremely well adapted to wool-growing, but the land is too valuable to raise sheep and dogs at the same time, and the latter have still the preference.

A stock law is not yet wanted, though it has many strong advocates, but those farmers possessing any prairie range are opposed to its passage.

Rail fences are mostly in use; Osage orange hedges may well be stated to be a success, and miles of them are planted annually.

The county is excellent for fruit-growing purposes, and principally so on the bluffs bordering the Mississippi river; but fruit-raising is not as yet as extensive as it should be. Much attention has been paid to viticulture, and the county has many extensive grape-growers, and considerable quantities of wine are made.

A great deal of live stock, hogs, cattle, horses and mules are shipped to Chicago and St. Louis. The county having direct communication by rail to the former, and both rail and water to the latter city.

The immigration to this county since the war has been comparatively small, the tide flowing farther west.

The public schools are generally doing well, and the county has, with few exceptions, a good class of tried and experienced teachers. The schools are mostly of a high grade, and especially so in Hannibal and Palmyra.

McDONALD COUNTY.

This county is situated in the extreme southwest corner of the State, being bounded on the west by the Cherokee Nation and on the south by Arkansas. It was organized March 3, 1849.

The surface is rolling and hilly, with many fine prairies and valleys. The bottoms are very rich and fertile, and the soil on the uplands is well adapted to fruit and grapes. The flat woods, covering quite a large area, are very fertile, and best adapted to wheat and tobacco. The hills are covered with a dense growth of timber, consisting principally of pine, cedar, oaks, hickory, walnut, ash, etc.

The county is well watered by many beautiful streams, the largest of which is the Elk river, which passes almost through the center of the county, and is navigable for flat-boats. Numerous springs of the purest of water issue from the sides of most hills, and afford, with the many creeks, abundant stock water. On many of the rapid streams are excellent sites for mills and other manufacturing establishments.

The mineral resources have not yet been developed, but many minerals have been discovered in differents parts of the county, principally lead, which is mined in a few places. Iron and tripoli are also found, the latter in large quantities.

Only a few grist and saw-mills are at present in operation, and also one castor oil manufactory.

The climate is mild and healthy. There are (census 1870) 21,958 acres of improved land; 40,762 acres of woodland, besides 4,256 acres of other unimproved land. The land is worth from $5 to $30 per acre for improved land, and from $2 to $5 per acre for unimproved land. The A. & P. R. R. owns about 100,000 acres of land, which is in market and quite cheap.

The leading occupation is agriculture, and there are (census 1870) 5,226 inhabitants. The principal agricultural staples are corn, wheat, oats and tobacco, yielding a fair average; from 750 to 1,200 pounds of the latter is about the average yield. Cotton does well, but is cultivated only to a limited extent. Tame grasses are cultivated but little, there being so large and fine natural pastures, and consequently a stock law is not wanted. With plenty of range, and a mild winter, the county is well adapted to stock-raising, and much attention is being paid to this profitable industry.

Grapes and fruit are grown successfully and yield abundantly. Wild grapes, and some of them equal to the tame varieties, grow luxuriantly on the hillsides and in the valleys, and viticulture is engaging the attention of many farmers.

The leading exports are corn, wheat, lumber, live stock and fruit, which are mostly transported on flatboats to points on the Grand and Arkansas rivers, where they meet a ready market. The nearest railroad is the A. & P. R. R., running north of the county through Newton county.

With cheap homes in the fertile valleys and bottom lands, the county has attracted considerable immigration from Tennessee, Kentucky, Ohio and Indiana, and there is yet plenty of room for the enterprising and energetic farmer.

Most of the sub-districts are provided with neat and comfortable school houses, and great interest is manifested at present in the cause of education.

MERCER COUNTY.

It is situated in the northern part of the State, in the fertile region known as the "Grand River Valley," midway between the Missouri and Mississippi river, and was organized February 14, 1845.

The surface of the county is undulating, and consists of about equal parts of prairie and timber, and hardly any poor land can be found within its limits. The soil of the prairie is mostly a sandy, rich loam, with some white clay lands, much of which is not yet cultivated. The timberland is generally more compact, and better adapted to wheat.

Timber is still abundant, and with proper care will supply all future demands.

The county is well watered by many streams, skirted with a heavy growth of timber on both sides, and affording all the necessary water. Grand river, with an average width of thirty-five to forty feet and a depth of about two and a half feet, is the principal water-course; it is a clear and rapid stream, affording many excellent mill privileges and other manufactories, and the county has now several flouring, saw and woolen-mills; three flouring-mills are run by water, and one by steam.

Except coal, which is found in many parts of the county, no minerals have been developed. Fire-clay, sand and limestone are abundant.

The county had, in 1870, 81,853 acres of improved land; 81,429 acres of woodland, and 43,685 acres of other unimproved land. Since the completion of the railroad, the price of land has considerably increased. The average price of improved land is from $10 to $25 per acre, and of unimproved, from $5 to $10 per acre.

Agriculture is the leading occupation of the 11,557 inhabitants (census 1870.) The principal productions comprise corn, wheat, rye and oats, which are, with the exception of the first, largely exported. Corn is fed to cattle and hogs, and thus marketed.

All the cereals and vegetables yield usually a very good crop. Timothy is grown to some extent, yielding very largely on the bottom lands. Blue grass also does very well.

Much attention has been paid to the introduction of improved stock, the county being well adapted to stock-raising, as is shown by the great numbers of cattle, hogs, horses and mules sent to market.

The rail fence is principally used, costing about $5 per acre. A stock law is not wanted at present by a majority of farmers.

Fine orchards are found in great numbers all over the county, which produce well, and great quantities of apples are shipped to market. The grape is grown by almost every farmer for table use, and with success.

Chicago is the market for stock and surplus grain, being connected with this county by the C. R. I. & P. R. R., passing from north to south through the county, having about twenty-five miles of track within its limits. Lumber and hoop-poles also form quite an item in the revenues of Mercer county.

There has been considerable influx of immigration since the war; mostly industrious farmers from the Eastern and Middle States, and many more are wanted to settle on the cheap and fertile lands.

There has been a marked improvement in the last year in providing comfortable and better furnished school-rooms, and the people are thoroughly alive to the necessity of public schools.

MILLER COUNTY.

This county, organized February 6, 1837, is situated in the central part of the State, within a days' drive of the Capital. The general surface of the county is hilly, the elevations varrying from 50 to 600 feet above the level of the Missouri river, yet but little of its surface is too steep and abrupt for cultivation. The most broken and rocky ridges are near the Osage river and its larger tributaries, and become gradually more gentle further back. Almost every kind of soil is met with, from the barren, flinty bluffs, to the deep and dark alluvial bottoms; but the most of the land is susceptible of cultivation, yielding fine crops, when properly cultivated.

The Osage river runs nearly through the center of the county; is navigable at high water as far up as Osceola, and affords, with its many affluents, an excellent drainage, an abundant supply of water for farm use, and a very great water-power for almost any machinery. Numerous springs, with cool and clear water, are found everywhere.

The county has plenty of timber, there being only very few prairies located on the high country in the northwestern townships. The timber is of good quality, abundant for all practical purposes, and consists chiefly of the several varieties of oaks, walnut, hickory, butternut, pecan, ash, elm, sycamore, etc. Very large timber is found along the Osage river and on some of its tributaries.

The climate is very salubrious, and not subject to extremes of either cold or heat.

Limestone and sandstone, excellent for building material, are found in many places. The mineral resources are very varied and rich, and only a small portion of them have been developed.

Lead seems to be the leading mineral; it is found in vast quantities in many parts of the county, and has and is being mined to some extent. Two large smelting furnaces are in constant operation, producing a large amount of lead.

Large deposits of iron ores, such as hematite and specular iron, have been known to exist in this county for many years, and is mined at three different places.

Copper and zinc have also been found in small quantities, and bituminous coal occurs near the iron banks. Kaolin, in paying quantities, is found in several places.

Besides the two smelting furnaces, the county possesses two steam and four water-power-flouring-mills; several saw-mills; four carding machines; one wool factory; two small cheese factories, and a number of blacksmith, wagon and plow-shops.

The county had, in 1870, 40,664 acres of improved land; 138,932 acres of woodland, besides 947 acres of other unimproved land. The prices of improved and unimproved lands are quite low. There is considerable government land in the county, mostly of inferior quality.

The leading occupation of the 6,616 inhabitants is agriculture.

The principal staples are corn, wheat, oats, rye, tobacco and hay, all yielding large crops. Wheat and tobacco are the commodities for export; the latter is cultivated quite extensively, the climate and soil being so well adapted to its growth.

Clover, timothy and blue grass are receiving marked attention, and meadows are becoming quite extensive. Blue grass seems to be natural to the soil, and is rapidly taking the place of coarser wild grasses.

Much attention has been paid to the profitable stock-raising, and the introduction of improved breeds of all kinds of animals. This county is extremely well adapted to sheep-husbandry, and many farmers would enter into it with zeal and profit but for the curse of useless curs.

Fat beef cattle, hogs, horses, mules and sheep are raised to some extent for market, and form the principal revenue of the farmer.

A stock law is desired by the greater part of the practical farmers.

Rail fences are principally in use, and hedges of Osage orange are planted successfully.

The county is well adapted to the raising of fruit of all kinds, and the number of orchards is rapidly increasing.

Miller county has no railroads, but several practicable routes for them have been surveyed through it. As already mentioned, the Osage river is navigable, and a few small steamers furnish the means of transportation. The principal market is St. Louis, which is reached by this river and the Pacific Railroad.

The county has received a fair share of immigration since the war, mostly from the eastern and northern States and Germany, mostly enterprising and industrious citizens, and there is room for thousands more.

MISSISSIPPI COUNTY.

This county, situated on the "Father of Waters," in the eastern part of the State, opposite the mouth of the Ohio river, was organized February 14, 1845.

The surface of the county is level, being almost entirely composed of bottom land, and is, with the exception of a few praries, heavily timbered, principally with oak, cypress, walnut, gum and numerous other kinds of timber. The soil is rich, warm and easily cultivated.

The county is almost entirely surrounded by the Mississippi river, and has also the James Bayou running through its center, rendering the county susceptible of easy drainage.

No minerals have been found in this county. Brick clay is found in abundance, so that the want of rock is comparatively little felt.

There are no manufacturing establishments in this county, except one for carriages and buggies, also one planing, sash and furniture factory.

There were (census 1870) 21,109 acres of improved land; 26,352 acres of woodland, besides 14,543 acres of other unimproved land. The average price of improved land is $30 per acre, and of unimproved land, $10 per acre, having somewhat advanced since the war.

According to the last census, the county had a population of 4,982, whose chief pursuit is agriculture.

Corn, wheat and cotton are the leading productions. The soil is adapted to all cereals and fruits that will grow in this latitude. The crops of 1874 are light in consequence of the extreme drouth of that year, except of wheat, which yielded about twenty bushels per acre. Cotton is cultivated successfully, yielding from 400 to 600 pounds per acre, according to the amount of care bestowed upon it. Tobacco grows very heavy, and is too coarse to command a good price. Cultivated grasees are not cultivated to any extent, there being excellent natural pasturages.

There are at present but few improved breeds of animals in this county, but are greatly needed to get rid of some of the extremely long-snouted creatures called hogs or "gutter snipes." Sheep do well, but are destroyed by dogs to such an extent as to discourage the farmers from trying to raise them. A stock law would meet a sharp opposition at present, though it has many advocates. Rail fences are generally in use, costing about $200 per mile, and for repairs about $10 annually. Hedges of Osage orange have been tried to some extent, but are hard to keep in due bounds, and consequently have been abandoned. All fruits, except cherries and plums, succeed well.

The facilities for market are good, the county being crossed by two railroads, one from east to west, and one from north to south, and having also the Mississippi river on the east and south side. The wheat is principally shipped to St. Louis, and the live stock to southern markets.

There has been a considerable immigration since the war, chiefly an industrious, but poor class from Tennessee, Illinois and Kentucky.

MONITEAU COUNTY.

This county is situated on the southern shore of the Missouri river, and is about the most central county in the State; it was organized from Cole and Morgan, February 14, 1845.

The bottom land on this river is famed for its fertility, and similar land is found on the Moniteau, Moreau and other streams.

The eastern, northern and central parts of the county are covered with timber, while the southern and western portions are mostly prairie, with fine timber along the water-courses. The soil of the woodland is light, excepting the flats, which are very rich. Timber of excellent quality is abundant, and adequate for all future demands, if properly cared for. Considerable quantities have been cut for railroad ties, but the rapidly growing second growth will be in a few years of sufficient size for all practical purposes.

The county is well watered by many fine streams, the largest of which have been already mentioned, furnishing excellent water-power, and which, with their numerous affluents, furnish all the necessary water for farm use. Good water can also be had by digging from 10 to 30 feet.

The county possesses an immense wealth of minerals, principally lead, coal and iron. Both cannel and bituminous coal are mined in different parts of the county, and lead mining is rapidly increasing, principally near California. Excellent potter's clay is also found near this town.

The manufacturing interests consist of five steam-flouring-mills; two cheese factories; one agriculturral implement and furniture manufactory; six wagon shops; three saw-mills; one paper-mill; two carding and one flax-mill.

The county had, in 1870, 98,029 acres of improved land; 116,759 acres of woodland, and 14,726 acres of other unimproved land.

The leading occupation of the 11,375 inhabitants (census 1870) is agriculture. The average price of improved farms varies according to location, quality, etc., but may be stated as from $10 to $20 per acre; of unimproved land, from $4 to $6, per acre; of timber land $8 to $10, and of improved prairie and bottom land, from $20 to $25 per acre.

The leading agricultural staples are wheat, corn, oats, flax tobacco and potatoes, forming also the commodities for export, clover, timothy, blue grass and Hungarian grass are largely cultivated for pasturage and hay, and considerable clover seed is shipped to market. Considerable numbers of stock of all kinds are raised for sale, and much improvement has taken place in them. Much attention has been paid to the raising of fine mules and milch cows. Although much injury is done by numerous worthless curs, sheep-raising is a source of much revenue, and considerable quantities of wool are clipped annually. A stock law seems not to be wanted, timber being cheap and the ranges excellent. Rails are mostly used for fencing purposes, except on the open prairie land, where Osage orange hedges have been successfully introduced. Considerable attention has also been paid to fruit-culture and the growing of the grape-vine, and both are attended with great success. St. Louis, Kansas City and Jefferson City are the principal markets.

The means of transporting live stock and produce to these markets is furnished by the Mo. P. R. R., which passes through the central part of the county from east to west, and fór the northern part the Missouri river.

Many immigrants have settled in this county since the war, mostly from Pensylvania, Ohio and Germany.

MONROE COUNTY.

Monroe county is situated in the northeast central portion of the State. It was organized January 6, 1831. The surface of it is for the most part a beautiful plain, sufficiently undulating to drain well its surplus water into its fine and abundant streams, which run through its entire length from west to east. Prairie and timber are about equally divided. The soil is rich and highly productive, almost unsurpassed for the purposes of raising grain or pasturage. The Salt river and the Indian Creek are the largest streams, both furnishing water-power. The climate is very healthy and pleasant.

Timber is abundant, and sufficient for all reasonable future demands.

Surface coal, much of it of an excellent quality, varying from one to five feet in thickness, and mixed with but very little slate, abounds, but little effort has been made to discover deeper coal-veins and no mines are in operation. Some fine specimens of iron ore has also been discovered.

The manufactories of this county are six flouring-mills of fine capacity; one woolen factory and a small number of blacksmith shops.

The county had, in 1870, 226,132 acres of improved land; 115,602 acres of woodland, and 11,895 acres of other unimproved land. There being very few sales of land, it is rather difficult to give the exact prices of land; the average price of improved land is about $12.50 per acre, and but little lesss for unimproved land. The price of land has decreased considerably since the war for the same reasons as given in other counties.

There were in 1870, 17,149 inhabitants, chiefly occupied with agriculture. The leading staples are corn, wheat and tobacco. Mixed husbandry is in the main the practice in farming. The commodities for export are tobacco, wheat, hogs, sheep, cattle, mules, etc., as in other counties. On account of a protracted drouth in 1874, the average yield is much below the usual one. Tobacco is quite largely cultivated, and yields quite a revenue to the people, from 400,000 to 1,000,000 pounds being raised annually, selling at from $7 to $10 per 100 pounds. Other fruits and cereals are raised successfully for home consumption. Blue grass is perfectly at home on the soil of Monroe county. Clover and timothy does well.

Stock raising is profitable, and many thousand heads are sold annually. Improved breeds of stock have been largely introduced, with fine results. Sheep-raising is only moderately profitable, there being too many dogs raised, and not of an improved breed either. A stock law is wanted by few farmers.

Rail fences are almost exclusively in use, and there being plenty of timber, are not costly. Some few have been experimenting with hedges, and had good success.

Orchards do very well, but are generally sadly neglected. But few are engaged in viticulture, and only a few acres are planted in grape-vines.

The facilities for transportation for the surplus wheat and live stock are excellent. The M. K. & T. R. R. runs diagonally through the county from northeast to southwest. The H. & St. J. R. R. runs along the north border of the county, touching it at one point, and the N. M. R. R. is within a reasonable distance of its southern border.

The principal markets for tobacco is St. Louis; for mules and horses, the south, and for other stock, St. Louis and Chicago.

Comparatively little immigration has taken place since the war.

MONTGOMERY COUNTY.

Montgomery county is situated in the eastern part of the State, and was organized from St. Charles, December 14, 1818. It was named in honor of General Montgomery, who fell at Quebec. The extreme southern part of the county borders on the Missouri river for a distance of 12 miles.

The surface of its central and northern portions consist of gently undulating prairies, with frequent groves of timber. Along the river is found rich alluvial bottom-land, well known for its fertility. Between the bottom lands and the prairies are high limestone bluffs. The soil on the high lands is largely mixed with black and white sand, making it remarkably quick in producing, and well adapted to fruits of all kinds, and especially so for wheat.

About one-half of the county is timberland, and mostly situated in the southern part and along the several streams which meander through it, furnishing an ample supply of water for stock, but very little water-power. There is yet plenty of timber for all practical purposes, and a considerable amount is sent out of the county for railroad ties, staves, etc.

The mineral resources consist principally in coal, which is found in several places, but only mined at one place, where some 40 to 60 operatives are employed. Good building stone is abundant, and a fine quality of marble has lately been discovered.

The climate is mild and healthy. Several mineral springs are in this county, which have acquired some local fame for their medicinal qualities.

The county had, in 1870, 68,029 acres of improved land; 116,759 acres of woodland, and 14,726 acres of other unimproved land. The price of improved farms varies from $20 to $60 per acre; of hill land it averages $5, and of unimproved prairie, $12 per acre. Land has decreased one-fourth to one-third in value in the past six or seven years.

The leading occupation of the 11,375 inhabitants (census 1870) is agriculture.

The manufacturing establishments consist of 13 mills for grinding and sawing; one for grinding corn only; 3 carding machines; 1 foundry; 1 cheese factory; 1 box factory; two tobacco factories, and two agricultural implement manufactories.

The leading agricultural staples are corn, oats and wheat. Exports are chiefly hogs, cattle, horses, mules, oats, hay, tobacco and wool. Tobacco of a good quality is raised quite largely, and is one of the most important crops of the county, the soil being finely adapted to the growth of it. Blue grass seems to be the natural production of the land. Clover and timothy are cultivated with fine success.

Considerable attention is paid to the raising of stock, and very large numbers of animals are exported annually. There is an increasing spirit to raise improved stock, and with good success. A stock law is badly needed in this county, but a small majority would vote against it. All kinds of fences are used, principally, however, the rail fence. The use of Osage orange for fencing purposes is rapidly increasing, and many have been planted with satisfactory results. Fruit-raising is very successful, and many orchards are being planted. The growing of grape-vines is a success, principally on the river bluffs, and there are many small vineyards scattered over the county, and considerable quantities of wine are made.

The St. L. K. C. & N. R. R. runs from southeast to northwest through the county (28 miles of track), affording, with the Missouri river, the necessary means of transportation to the market, which is St. Louis.

There has been quite an influx of immigration to this county since the war, and until about 1870, mostly a middle class of farmers from the Eastern States.

MORGAN COUNTY.

Morgan county is situated in the central part of the State, and was organized from a part of Cooper, January 5, 1833.

It has an elevated range of country tending in a direction nearly east and west through it, a little south of the middle, constituting a divide, which causes the water north to flow to the Lamine through the channels of many fine creeks, except in the eastern portion, where the Moreaus take their rise and flow in a northeast direction. These streams afford excellent water-power.

The surface of this portion of the county is chiefly prairie, comparatively level or undulating, with intervening woodlands, which afford timber for fuel, building, fencing, and other purpose, at convenient distances.

The soil is good—a portion of it excellent. South of the divide, the slope is less gentle than that north of it, becoming abrupt and even quite rugged as it approaches the Osage river, which forms the southern boundary of the county. This portion of the county is also well drained by a number of fine creeks, with sufficient water-power to drive almost any amount of machinery. The surface is covered with timber of good quality. The soil is not as good as that north of the divide, except the fertile creek and river bottoms. The uplands, while not so good for corn, are well adapted to the growth of wheat, tobacco, etc.

Coal and lead abound in large quantities, and the indications are that iron is also abundant, but has not been sought after. The coal is of very fair quality, and the lead is the pure Galena, and both form the all-absorbing interest. The county has eight or more mines, giving employment to about 65 regular and 70 irregular operatives, producing last year about 3,120,000 pounds of lead.

Besides one woolen factory, the county can boast of eight flouring-mills.

There were in 1870, 66,076 acres of improved land; 100,220 acres of woodland, and 7,055 acres of other unimproved land.

In consequence of the general depression of the farming interest, with an unprecedented drouth, the price of land is merely nominal, and may be stated at about $15 per acre for improved prairie farms; $8 per acre for unimproved prairie; $9 per acre for improved timber farms, and $5 for unimproved.

The occupation of the 8,434 inhabitants (census 1870), is chiefly agriculture.

The leading agricultural staples are wheat, oats, corn and hay, of which wheat and oats are the principal exports, the two others being fed to stock. The same holds good in regard to the low average yield in 1874, as stated of other counties.

Tobacco was formerly grown successfully to a considerable extent, but owing to the restrictions put upon the sale of it, has been nearly abandoned.

Cotton, sorghum, etc., are grown in a limited way for home consumption.

Tame grasses have been but little cultivated for pastures, as the wild grasses of the unimproved lands afford cheaper grazing.

Improved breeds of cattle, hogs and sheep have been introduced by a few farmers.

Sheep-raising would be very profitable but for the dogs. In localities contiguous to the Osage river, some injury has been occasioned by the wolves, but in most instances the dog's depredations have been charged to the wolf, who is in disrepute, and hard to catch. A stock law is not wanted at present.

There is an abundance of timber for fences, generally rail fences, and the cost is therefore not large. Osage orange hedges are also used to some extent, and with good success.

Fruits of all kinds common to this latitude, and grape-vines, can be successfully grown.

The facilities for transportation are not very good at present. The P. R. R., which crosses the north end of the county, affords the only permanent means of transportation, as the Osage river is only navigable at high-water stages. St. Louis receives almost the entire amount of the exports.

The influx of immigration for the first few years succeeding the war was considerable, being chiefly from the eastern and northern States, and a good class of citizens. Of recent years there has been almost none.

NEW MADRID COUNTY.

This county is one of the three extreme southeastern counties of the State, being bounded on the south and southeast by the Mississippi river for a distance of about 50 miles. The county was organized———. Its surface is very level, in many places low and wet, being overflowed or swamp land, lying principally on the St. John's Bayou and on Little river. The soil is generally sandy, alluvial, very fertile, and easily cultivated. The county is watered in the interior by Little river and a few bayous, all sluggish streams, and not affording any water-power.

Except a prairie in the northern, and another in the central part, each of about 20 square miles, the land is well timbered, chiefly with oak, ash, hickory, elm, cypress and gum. There is plenty of timber for years to come, except in the older settled parts, near towns.

There are no mines in operation. In the northern portion, in a swampy region, there is found a species of bog iron-ore, which, with the aid of capital, could be made very profitable.

The county boasts of but one flouring-mill, and that of such recent date that its utility cannot be said to have been fairly tested.

Two-thirds of the county has been affected by the earthquakes of 1811 and 1812. These swamp lands can and will, in time, be drained, which is quite practicable, and will then be unsurpassed for fertility.

The county had, in 1870, 35,385 acres of improved land; 95 acres of woodland, and 34,943 acres of other unimproved land. The average price of improved land is about $10 per acre; varying from $50 near the county site and the river, to $3 where most remote. There is but a limited demand for it, and the price has not materially changed since the war.

The county had, in 1870, a population of 6,357, chiefly employed in agriculture.

The leading products are corn and cotton. For many years this county has been noted for the large amount of corn exported, and it is only during and since the war that cotton has arrived at the dignity of an export. Cattle, hogs and wheat are also no small items as exports.

The crops of 1874, in consequence of the unparalleled drouth of the summer, do not amount to quite one-half of an average crop.

The usual average yield of corn is probably about 40 bushels per acre, though some of the alluvial lands, when first planted, have been known to produce an average of very nearly 100 bushels per acre. The average yield of wheat is 15 bushels per acre, and of cotton, but little over half a bale per acre. Neither barley, rye, hemp, flax, sorghum, etc., are raised for exportation, but yield well.

Grass is not cultivated, the swamp land yielding an abundance of grass of luxuriant growth, and very nutritious, and they, together with the canebrakes, scattered over the county, afford an excellent winter range.

A few hundred hogs and neat cattle are annually exported, but mules and horses are imported. No improved breeds have been introduced thus far.

Sheep-raising is not carried on to a great extent, and is not considered profitable. A stock law is not desired by any considerable number of farmers.

The old fashioned worm-fence is almost exclusively used; rails are usually made and put up for $2 per hundred, and often for less. Hedges are found on a few farms only.

Small orchards are numerous, and apples and peaches of good quality rarely fail.

Grapes, where they have been tried, do well, but their culture is very limited.

The Mississippi river is the principal outlet for produce, and in the northert part of the county it is shipped by the C. A. &. T. R. R. The markets are St. Louis and Memphis for cotton, and New Orleans for corn.

The tide of immigration has not set towards this county since the war, and yet New Madrid has many advantages, such as cheap and fertile lands, and a good climate, avoiding, as it does, the extremes of heat and cold.

NEWTON COUNTY.

Newton county lies in the southwestern part of the State, and is bounded on the west by the Indian Territory and Kansas. It was organized December 31, 1838. The surface is about equally divided between timber and prairie. The latter is generally rolling or undulating, while the former is hilly, less productive, and in some parts quite rocky.

The flatwoods have a rich and productive soil, and the bottoms are unexcelled. The soil is generally of a dark color, in some places mulatto loam, with a reddish, clay subsoil. Some portions of the prairie are underlaid with gravel, and are more easily affected by dry weather.

Timber is quite abundant, and will supply all future demands, if cared for.

Springs are very abundant everywhere, and some of them of powerful and unvarying flow.

The county is well watered by many fine creeks and their numerous affluents, some of which furnish excellent sites for mills and other manufactories.

The minerals found in this county, and the manufactories incident to them, will constitute the basis of wealth in the future. The county has probably the richest lead mines in Southwestern Missouri; and 11 or 12 furnaces, running day and night, are insufficient to smelt the ore. The Granby Mines, discovered in 1855, yielded, up to the commencement of the war, over thirty-five million pounds of lead; and since that time, up to the spring of 1873, seventeen million pounds. Other mines have also produced an immense quantity. Coal and iron have also been discovered, and also an excellent quality of tripoli.

The list of manufactories is as follows: Lead furnaces; flouring and saw-mills; 1 foundry and machine-shop; 2 wagon factories; 1 sash and door factory; 1 planing mill; 1 distillery, and tripoli, tobacco and woolen factories.

The census of 1870 gives 47,283 acres of improved land; 60,166 acres of woodland, and 18,951 acres of other unimproved land. The A. & P. R. R. owns about 160,000 acres of land, which is in market. The price of improved farms is about $15 per acre; of unimproved, $8 per acre; of prairie, $7 per acre. and of bottom, $10 per acre.

The county had, in 1870, 12,821 inhabitants, chiefly occupied with mining and agriculture.

The leading agricultural productions are corn, oats and wheat; and the commodities for export, besides the minerals, are wheat, corn, tobacco and live stock; but only little of the two former articles, for which there is a lively market at home.

The soil and climate are well adapted to the culture of tobacco, and its raising is profitable. Cotton, sorghum, barley, etc., are successfully grown for domestic use.

The natural pastures being yet very extensive and good, comparatively but little attention has been paid to the growing of any of the tame grasses.

A large number of beef cattle and fat hogs are raised for market; and also a good number of horses and mules.

One of the most profitable branches of husbandry, is the raising of sheep, which thrive with little cost and attention on the luxuriant wild grasses, and disease to them is almost unknown.

Considerable progress has been made in improving the breeds of all kinds of stock, but most so in hogs and sheep.

A stock law is not wanted, for the reason already mentioned.

There is yet plenty of timber for fencing purposes, and rails are mostly used, costing from $2 50 to $3.00 per hundred, delivered and put up. Hedges are also a success.

The soil and climate are peculiarly well adapted to the raising of fruit of all kinds, and the wild grape flourishes on all the hillsides.

The facilities of transportation of the live stock, produce and minerals, are furnished by the A. & P. R. R., which has thirty-three miles of track in the county, traversing its centre from east to west. The M. C. & N. W. R. R. runs through the northeastern corner.

The climate is excellent, and the mild winters, pleasant summers, fine water, etc., are well acknowledged, and have drawn quite an influx of immigration to the cheap land of this county.

NODAWAY COUNTY.

This county, a part of the "old Platte purchase," is situated in the northwestern part of the State, and was organized Februry 14, 1845. The surface of the county comprises about three-fourths undulating prairie, and one-fourth timber. Hills and swamps are not found within its borders. The soil is a black, rich clay loam, of an average depth of two and a half feet, and very productive. There is not a single quarter-section in this county which is not adapted to farming.

Timber has been plenty for fencing until the last two years. The prairie is settling up so fast that timber is getting scarce.

The county is well watered by three rivers, running from north to south through it, affording good water-power for mills, etc., and with their numerous tributaries furnish all the necessary water for stock. These several water-courses are heavily timbered with the many species of trees growing in Northern Missouri, and the very fertile bottoms are from a half mile to one and a half miles in width.

Coal, both bituminous and cannel, is found in some parts of the county, but to no great extent, and is obtained by surface digging.

Lime and sandstone, for building purposes, is abundant; one grindstone quarry is operated, and fire and brick-clay is found of excellent quality.

The county had, in 1870, 111,803 acres of improved land; 59,858 acres of woodland, besides 80,601 acres of other unimproved land. The average price of improved land is from $20 to $40 per acre, and of unimproved, from $10 to $20 per acre. The price of land has about trebbled in the last eight years.

The manufacturing interest of the county consists of ten flouring-mills; one woolen-mill; one agricultural implement factory; one cheese factory; several saw-mills; one carriage factory, and one sash and broom factory.

The leading occupation of the 14,751 inhabitants, (census 1870,) is agriculture, and the principal farming productions are corn, wheat, barley, oats, rye and potatoes. Wheat, barley, oats and rye are the most exported; corn and potatoes being mostly consumed at home.

The crops of small grain for 1874, averages well with other years, but corn and potatoes are only about half a crop. The average yeild for 1874, is about as follows: of corn, 25 bushels per acre; of spring wheat, 16 bushels per acre; of fall wheat, 30 bushels per acre; of oats, 35 bushels per acre; of potatoes, 200 bushels per acre, and of hay, two and half tons per acre.

Tobacco is raised very little, but does well. Other cereals and vegetables are raised to a limited extent for home consumption, and yield largely.

With short and mild winters, with abundant pure stock water, the freedom of ranges and pastures from noxious weeds, and the certainty to raise clover, blue grass, timothy, etc., it is certain that this county is extremely well adapted to stock-raising, dairy purposes and dairy farming. Blue grass is used to a great extent for pasturage, and with good results.

A great number of neat stock, horses, mules, sheep and hogs, are annually sent to market. Improved stock of all kinds has been successfully introduced.

With fewer dogs sheep-raising would be much more profitable than it is at present.

A stock law is not wanted by a majority of the people, as long as there is so much prairie grass to be utilized, and the better farmers desire a modification of the present law.

Rail and plank fences are chiefly in use, the former costing about $1.25 per acre. Hedges have been tried, and with good success, and principally the Osage orange.

People are generally successful in raising fruits of all kinds, and many orchards have been planted, and their area is fast increasing. Grapes yield well, but are as yet little cultivated.

The facilities for shipping are good, the county being traversed north and south, and almost through its entire center by the Maryville Branch of K. C., St. Jo. & C. B. R. R.

The leading market for both grain and all stock is Chicago; but little barley being shipped to St. Louis. The county needs a more direct route to that city.

There has been a very large influx of immigration since the close of the war, and the population has about trebbled; the emigrants are mostly from the States of Ohio, Indiana, Illinois, Wisconsin and Iowa.

OREGON COUNTY.

Oregon county is situated in the southern part of the State, bordering on the Arkansas State line. It was organized February 14, 1845. The county is generally undulating and hilly. The soil is rich in all those elements that constitute the food for plants, but large portions of the soil abound in rocks and gravel to such an extent that it is unfit for cultivation. The land is generally timberland; the northeastern part is covered with a dense forest of tall pines. The different kinds of oak, hickory, walnut, elm, hackberry, etc., forming the principal timber. There is timber enough for all practical purposes, for fencing, building, fuel, etc., and for all the railroad ties that will [illegible]er be used in this county, in fact, timber grows faster than it is used.

The county is well watered by several beautiful streams, affording ex[illegible] water-power.

Vast deposits of iron are found in almost every part of the county, and also lead and copper, but no coal. No mines are in operation.

The climate is as fine as in any other portion of Missouri, the mercury seldom falling below zero.

The county had, in 1870, 15,745 acres of improved land; 69,542 acres of woodland, and —— acres of other unimproved land. The average price of improved land is about $10 per acre, and unimproved land about $2 per acre.

The leading occupation of the 3,287 inhabitants (census 1870) is agriculture. There are several flouring-mills, saw-mills and shingle-machines in the county.

The agricultural staples are corn, wheat, oats, cotton, etc., of which cotton and wheat are mostly exported. Of commercial crops, cotton is the only one cultivated, about 200 bales being raised annually. The tax on tobacco prevents its culture. The natural meadows are amply sufficient for stock-raising, hence few or no attempts to cultivate any of the tame grasses for pasturage have been made.

But few efforts have been made to improve the breeds of stock. Few counties offer such fine inducements for sheep-raising as Oregon county, and but very little injury is done by dogs or wolves.

A stock law is not wanted. The fences are most commonly made of rails, and are so-called "worm-fences."

The county is well adapted to the raising of fruit and grape-vines, but too far from railroads to export green fruits. Isolated as this county is from the markets of this State, the grain, cattle and hogs are shipped South.

At the close of the war the county had, perhaps, 1,000 to 1,200 inhabitants; in 1870, 3,287, and now about 4,250. The States of Tennessee, Kentucky and Illinois furnished the largest numbers.

OSAGE COUNTY

Is situated in the interior of the State, bounded on the north by the "Big Muddy." It was organized from Gasconade, January 29, 1841. The surface of it is generally hilly, and broken by bluffs contiguous to the rivers. A great portion of the hilly land is productive, and the bottom lands are extremely fertile.

Springs are abundant everywhere, and the county is well watered by many rivers and creeks, but principally by the Missouri, Osage and Gasconade rivers.

Good timber is abundant, consisting chiefly of oak, hickory, walnut, elm, hackberry, maple, sycamore, ash, cottonwood, etc., and will be adequate for all future demands for a good many years to come.

Some coal has been found, but as yet not in paying quantities. Almost every hill contains iron ore, said to be of superior quality, but is not mined at present. The climate is excellent and very healthy.

There are some nine or ten steam saw and grist-mills in operation, one water saw and grist-mill, and two carding-machines.

The prices of land vary, according to situation and quality; river and creek-bottom farms selling from $10 to $50 per acre; upland or ridge farms from $5 to $10 per acre, and [illegible]berland from $1 to $5 per acre. On account of the opening and settling of the western territories, the high taxes levied in this State, and especially in this county, etc., the price of land has decreased at least one-third since the war.

The county had, in 1870, 55,702 acres of improved land; 1,327 acres of woodland, and 198,555 acres of other unimproved land. The number of inhabitants the same year was 10,793. Their leading occupation is agriculture.

The agricultural staples are wheat, corn, barley, oats, tobacco and potatoes, and the leading exports are wheat, barley, oats and tobacco. The average yield of wheat for the year 1874 is about fifteen bushels per acre, while corn can scarcely be averaged at all, a great many fields not producing seed, while a few others yielded as high as 40 and 45 bushels per acre—about the usual yield. Tobacco is still grown to some extent, but not nearly as much as formerly. Cotton is only grown for home use, and so it is with rye, hemp, flax, sorghum, etc. Blue-grass, clover, and red-top are used to some extent for pasturage, and successfully raised, if the season is not too dry.

A good many car loads of horses and mules, several car loads of sheep, and at least one thousand fat hogs are shipped annually from this county. Improved breeds of animals have been introduced with good success; in fact they are the only paying kind.

Sheep-husbandry would be one of the most profitable branches of agricultural industry in this county, but for the dogs. The sheep (and also the dogs) thrive well, are healthy and easily wintered.

The farmers of the county are pretty successful in raising fruits of all kinds common to this climate. The aggregate number of acres planted in grapes cannot be less than one hundred acres, and wine is being made in considerable quantities, meeting a ready sale, and is mostly consumed in the county.

The facilities for transportation to market consist of the Missouri river and P. R. R., on the north, the Osage river on the west, and the Gasconade river on the east. St. Louis is the principal market for the produce.

The immigration to this county has nearly ceased since the war, as many or more settlers have left the county during that time as have come into it.

OZARK COUNTY.

This county is situated in the southern part of the State, on the Arkansas State line, and was organized January 29, 1841.

The surface of the county is varied; mountainous in the central part, and broken in the eastern and western portions. The bottom lands are very rich and fertile, and most of the timberlands are well adapted to agriculture, having a productive soil, and excellent for the growing of wheat, tobacco and fruits.

The whole county is covered with timber of good quality, consisting of oaks, pine, hickory, walnut, ash, etc., abundant for all future demands.

The county is well watered by numerous creeks and springs, with water clear as crystal, so that the bottoms can be distinctly seen at a depth of ten feet, furnishing all the necessary water for stock, and also some fine water-power.

The county is said to be a rich mineral district, but as yet there are no mines opened. Lead and iron, and possibly coal, exist, and only capital is needed to bring the hidden treasures to the surface.

Very little can be said about the manufacturing interest of this county, consisting of some saw and grist-mills, scattered throughout the county, and there is plenty of room for more on the fine creeks.

The county had, in 1870, 7,692 acres of improved land; 1,244 acres of woodland, and 28.926 acres of other unimproved land. The price of land is quite low, averaging $5 to $6 per acre for improved land, including bottom and timber. The unimproved land mostly belongs to the United States and is sold at $1.25 per acre. There were in 1870, 3,363 inhabitants, whose leading occupation is agriculture, producing chiefly wheat, corn, oats, tobacco, cotton, etc., the two latter staples are grown to some extent, and with great success, the former being of a very fine quality, and the latter is generally classed in market as No. 1. Other cereals and vegetables are grown successfully for domestic use. No tame grasses are cultivated, nature being lavish in producing fine grass on the ridges and woods. The pasturage among the ranges afford grass the whole year round, and the stock thrives splendidly upon them, and consequently no farmer would vote for a stock law.

Some improved breeds of stock, principally sheep and hogs, have been successfully introduced. Sheep-husbandry is quite profitable, and would be more so, if wolves and dogs were less numerous.

Fruit of all kinds grow well, and much attention has been paid of late years to horticulture, and principally the raising of apples; large quantities of dried fruit are shipped to market. Grapes are only cultivated for home consumption, they do well on the southern slopes of the hills.

The county has no railroads, but other good roads. The principal market is Springfield.

There has been quite an influx of immigration since the war, and much more is wanted.

PEMISCOT COUNTY.

This county is situated on the Mississippi river, in the extreme southeastern part of the State, separated by that river from the State of Tennessee, and is bounded on the south by the Arkansas State line. It was organized from part of New Madrid February 19, 1861.

The surface of Pemiscot—signifying liquid mud—is an almost level plain; heavily timbered with ash, oak, walnut and cypress, of excellent quality for lumber and shingles, abundant for all present and future demands.

The soil of this county is of the richest character, being alluvial, and yielding often from 75 to 100 bushels of corn per acre.

The county contains many lakes and bayous. The Pemiscot bayou runs through the entire length of the county, and Elk chute traverses the western part, and is thus well supplied with water.

The county possesses no minerals, at least none have been discovered as yet.

Of manufacturing establishments, the same might be said, there being none but eleven cotton-gins, some grist and saw-mills and blacksmith shops.

The county contained in 1870, 8,919 acres of improved land; 84,342 acres of woodland, besides ——— acres of other unimproved land. The average price of improved land is about $10 per acre; of unimproved land about $2 per acre.

The leading occupation of the 2,059 inhabitants (census 1870) is agriculture.

The principal productions are corn, wheat and cotton, and the yields of them are very large, being 75 bushels of corn, 20 to 25 bushels of wheat, and 1 to 1½ bales of cotton per acre.

Pasturage, of tame grasses, has hardly received a fair trial.

The timber for fencing purposes is abundant.

The range for stock is excellent, the cattle keeping fat the year round without any special care; and consequently a stock law finds few or no advocates.

The fence mostly in use is the old worm rail fence.

Except in hogs, very few improved animals have been introduced; but as far as tried, have given entire satisfaction. Many hogs, beef cattle, horses and mules, are raised for market.

But few orchards are situated in this county, and fruits of all kinds, including the grape, do well, but are at present only cultivated for home consumption.

The surplus produce goes mostly to Memphis and New Orleans, although much of the cotton is shipped by river to St. Louis.

But little immigration has come to this county since the war. There is a fine opening for men seeking homes, and who desire to purchase cheap and productive land.

PERRY COUNTY.

This county is situated on the Mississippi river, in the eastern part of the State, and was organized November 16, 1820.

The surface of the county is generally undulating, with broken and hilly lands in the southeastern, and level river bottoms in the northeastern and eastern parts. The "Bois Brule Bottom," a large belt of country along the river, about six miles wide and eighteen miles long, is celebrated, being marvelously rich—often producing 100 bushels of corn per acre. A large region around the county seat has its surface indented with sink holes; and as Hon. W. H. Bennett writes: "Is drained by natural sewers underground. Here the water is carried off through caves, valleys and excavations beneath the surface. In fact, we have a little subterranean world beneath us, full of rippling rills, vaulted streets, palatial caverns and grottos, filled with monuments of stalagmites and festooned with stalactites. One of these caves has been penetrated a distance of four miles."

The county is well watered by many fine streams, traversing it in many directions; and most all afford good water-power. Silver Lake Spring, forming the principal source of the East Fork of the Saline, forms a lake of sufficient volume to run one of the largest flouring-mills in the county.

The county is well timbered. In fact, there is more timber now than formerly—covering our prairies—enough for all practical purposes and future demands.

The chief varieties of timber are cottonwood, oaks, locust, gum, hickory, walnut, etc., and great quantities of black walnut are shipped to St. Louis and other places.

The climate is mild and excellent.

Deposits of iron, lead and zinc, are found in different localities, but have not yet been developed. Only a few lead mines are in operation. Pure silica is found in great quantities in the southern part of the county.

The manufacturing interest consists of 12 flouring-mills; 8 saw mills; 3 woolen mills, 1 or 2 stave factories, and 1 furnace.

The county had, in 1870, 63,458 acres of improved land; 158,993 acres of woodland, besides ——— acres of other unimproved land. Lands adapted to agriculture range in price from $2 to $50 per acre, according to quality, situation and kind of improvements. Improved farms in the hills range from $10 to $30 per acre, and in the bottom from $20 to $50 per acre; unimproved lands from $2 to $12 per acre.

The leading occupation of the 9,877 inhabitants (census 1870) is agriculture.

The principal staples for home market as well as for export, are wheat, corn, barley, orchard products, wine, tobacco, hogs, beef cattle, horses, mules and sheep. The average yield is quite large. Timothy is grown to some extent, averaging about two tons per acre.

The county is well adapted to stock-raising, and considerable attention has been paid to the improvement of all kinds of stock. Although sheep-husbandry would pay well in a country so well adapted to it, but few flocks exceed one hundred and fifty.

Both stock and dog law seem to have not very many advocates.

The people of Perry county have been very successful in raising fruit of all kinds, considerable quantities of which are grown for market and domestic use. About 200 acres have been planted in grapes, which prove a great success, and peculiarly so on the river hills.

St. Louis is the principal market, which is reached by way of the Mississippi river. The county will soon have a railroad.

Immigration has been comparatively slight, but if its superior advantages are known, such as a mild and healthy climate, its cheap farming lands, low taxes, etc., there is no doubt that many immigrants will prefer to settle here than to go farther west.

PETTIS COUNTY.

Pettis county is situated in the west central part of the State, and was organized January 26, 1833. The general surface is gently rolling prairie, except along the streams, which are bordered with timber. The county is well watered by many creeks, with beautiful clear water, a pebbly bottom, and abounding in fish. The soil is a rich, dark loam, from 15 to 30 inches deep.

There is a diversity of opinion in regard to the timber being enough for all future demands; but for the present at least, there is enough for all practicable purposes, and, with proper care, enough for the future.

The mineral resources have not been largely developed. Coal exists in all parts of the county, and a number of banks have been opened, employing at present about 30 hands, but will soon employ many more.

Lead has also been found, but it has not been ascertained thus far whether it exists in paying quantities.

Iron occurs in several places. Red and yellow ochre is abundant. Potter's clay is worked, and emery, of superior quality, is found in large quantities.

The county has at present 6 steam-flouring-mills; one woolen factory; one foundry, and one agricultural implement factory.

The census of 1870 gives 196,024 acres of improved land; 79,282 acres of woodland, and 31,651 acres of unimproved land. The average price of improved land is about $25 per acre, and of timberland, $25 per acre. The price of land advanced very apidly for the first three years after the war, but has since declined, owing to the stringency of money matters, and for other reasons mentioned in the description of other counties.

The leading occupation of the 18,706 inhabitants, (census 1870,) is agriculture.

The principal agricultural staples are corn, wheat and hay; exports are mostly hogs and cattle.

Tobacco is raised to some extent, the timber lands being well adapted to its culture. Other cereals and fruits are successfully cultivated to a similar extent for home consumption.

Blue grass, timothy and clover are extensively used, the county excelling in good grass land.

Improved breeds of all kinds of animals have been introduced successfully. If less dogs were raised, sheep-raising would be very profitable.

A stock law was lost by a small majority last spring.

Rail fences are most in use, and rails can be bought for $5 per hundred; fencing timber from $1.75 to $2 per hundred, and posts from 12 to 16 cents each. Hedges have been tried to a considerable extent, and when properly cared for, with the best success.

Most interest has been taken in the culture of fruit, and many small orchards are being planted, succeeding well. Grape-vines do very well, and about 30 acres have been planted in grapes, producing a fine yield; wine is made, and finds a ready sale.

The facilities for transportation are the M. P. R. R., extending through the center of the county from east to west, and the M. K. & T. R. R, from the northeast to the southwest. St Louis is the principal market, although a considerable portion of the produce goes to Chicago.

There has been a considerable influx of immigration to this county, principally from the Eastern, Middle and Northern States.

PHELPS COUNTY.

Phelps county is situated in the southeast central part of the State, and was organized from Crawford, November 13, 1857 The county is intersected with numerous streams, several of which afford abundant water-power. Also numerous springs, furnishing the necessary water for household and stock, while good water can be found almost everywhere, by digging from ten to fifteen feet. The principal water-courses are the Gasconade, Little Piney, Dry Fork of the Meramec and Spring creek.

The elevation of the county is from 700 to 900 feet above the Mississippi river at St. Louis, and is, generally, rolling; along the streams broken and rocky, with occasionally almost perpendicular bluffs, from 200 to 800 feet high. The bottoms vary from a hundred yards to a mile in width, and are bordered by high ridges, upon the tops of which are wide tracts of level or slightly undulating land. Between these ridges the country, extending from one stream to another, is diversified with broad, smooth, but irregular swells, between which are exceedingly fertile valleys, not usually exceeding half a mile in width, but often several miles in length, and known as "prairie hollows;" the whole being sufficiently undulating to be well drained, and mostly level enough for agricultural purposes.

There is still an abundance of timber, an adequate amount for all demands, such as for railroad ties, fencing, building, fuel, etc., for years to come. The rich bottoms of all the streams sustain a heavy growth of trees, such as oak, walnut, maple, hackberry, sycamore, buckeye, etc. The slopes of some of the highlands are also covered with a forest of similar growth, while others produce only medium growth of different kinds of oak.

The soil is generally very productive along the bottoms and on the broad ridges. The hillsides produce an abundance of grass, and are especially adapted to viticulture, wild grapes growing there in profusion.

The principal mineral developed is iron. It has been estimated by a gentleman, well posted in metallurgy, that this county alone contains more first-class iron ore than the whole State of Pennsylvania. At present there are two furnaces in active operation, generally employing several hundreds of operatives. Lead has also been found in small quantities.

According to Professor Swallow, part of Dent, Crawford and Phelps counties have 2,700 square miles of coal, anthracite and cannel. Sand and limestone for building purposes, and clay for brick and pipes abound.

The county contains eight flouring-mills of importance, besides some smaller ones; one woolen factory; one foundry; four wool-carding machines; two large carriage and wagon factories; several blacksmith shops, making plows, harrows and other agricultural implements; one large saw mill; one tobacco factory; one tannery; two saddle and harness, and two tin-shops.

The county had, in 1870, 33,959 acres of improved land; 104,564 acres of woodland, and 5,287 acres of other unimproved land. There being hardly any sales, the average price of land is very difficult to give, but is certainly quite low, having decreased at least fifty per cent. during the the last five years. The county had, in 1870, a population of 10,506, whose leading occupation is agriculture.

The principal agricultural staples are corn, wheat, oats and hay, wheat outranking in 1874, every other crop in importance. The commodities for export consist principally of flour, corn, oats, potatoes, hides, poultry, game, hogs and cattle; also a few horses and mules. Tobacco, cotton, rye, etc., are only grown for home use, but succeed well. So does blue-grass, but is little cultivated, the county having a good and abundant range to fatten stock on. Clover does well, often producing several crops in one season.

Few improved breeds of stock have as yet been introduced—more in hogs than in other kinds. Sheep-raising might be made very profitable but for the dogs, many of them prowling over the county.

Only few farmers favor at present a stock law. About 95 per cent. of the fences are made of rails, costing about 60 cents per rod.

Fruits of all kinds do well, but until recently this branch of farming has been sadly neglected, but people commence to see the great advantages of good fruit. Almost every thrifty farmer has a patch of grape-vines, producing well; and there are at least 75 to 100 acres planted in grapes.

St. Louis is the principal market, and almost all the produce and live stock is marketed inside of the State. The A. & P. R. R., running diagonally across the county, furnishes, at present, the only means of transportation.

There was quite an influx of immigration into this county immediately after the war—mostly from Illinois, Ohio, Indiana, Pennsylvania, Kentucky, Virginia and Iowa, and generally consisting of an industrious and intelligent class of people.

The School of Mines and Metallurgy is located at Rolla, and is in a flourishing condition—having, according to the last report, 25 female and 73 male students.

PIKE COUNTY.

This county is situated in the eastern part of the State; is bounded on the east and the northeast by the Mississippi river, and was organized December 14, 1818.

The surface of this county is varied, but is generally gently rolling. Along the above mentioned river it is broken, with a very rich limestone soil, excellent for fruit and viticulture, and nearly all susceptible of culture. A few miles back from the river the surface is more level, and well adapted to fruit, tobacco and wheat. The central and western parts are fine prairies, very fertile, with a rich black loam, and adapted to all branches of farming.

The county is well drained and watered by many large and small creeks, and by numerous fine springs, affording all the necessary water for all purposes, excepting the central and western portions, which are not so well supplied with natural springs, but possessing an impervious clay subsoil, it is easy to construct cisterns and stock ponds.

Numerous mineral springs, with medicinal properties, are found, as well as springs highly charged with salt, but not enough for manufacturing purposes.

The greater part of the river bottoms, and all the hilly land, was originally densely covered with forests, and there is still enough timber for all practical purposes, and with proper care, enough to supply all reasonable demands of the future.

The climate is equal to that of any county of northern Missouri. Pleasant springs, summers, autumns, generally cold winters, and quite healthy.

The mineral resources of this county are confined to a valuable vein of coal in the southwestern part, and inexhaustable quantities of excellent limestone, building stone and brick, fire and potter's clay, and gravel of very good quality for the construction of gravel roads, macadamizing streets and ballasting railroads.

There are several large manufacturing establishments in operation in the larger cities and towns of the county, enough to supply most of the wants of the community.

The county had, in 1870, 174,840 acres of improved land; 140,444 acres of woodland, besides 30,616 acres of other unimproved land. The prices of land are low at present; improved land ranges from $12 to $150 per acre, according to locality, quality of soil and improvements; unimproved lands vary from $5 to $75 per acre.

The leading occupation of the 23,076 inhabitants is agriculture, and the leading staples are wheat, corn, oats, tobacco, hay, horses mules, neat cattle and hogs.

The wealthy, intelligent and enterprising stock-growers and farmers of the county have long been wide awake in improving their stock, and many blooded animals have been successfully introduced.

Orchards are also a great source of profit, and there are a great many of them scattered over the county, producing a rich annual yield of fine fruit. Considerable attention has been paid to the cultivation of the grape, and there are many extensive and smaller vineyards in the county, producing much wine.

The county possesses good means of transportation to market, having about 85 miles of railroad in operation and in course of construction. The completed railroads are the L. & M. R. R. R., and the C. & W. R. R.

The county received a very fair share of the immigration since the war, mostly industrious farmers from the older States.

PLATTE COUNTY.

In the northwestern extremity of the State of Missouri cluster the six counties, whose area constitutes the tract of country known as the "Old Platte Purchase," a region famed for its remarkable salubrious climate and great fertility of soil. Throughout its whole extent the eye of the agriculturist meets with all the signs of a productive soil. Platte county is bounded on the west and south by the Missouri river; it was organized December 31, 1838.

The surface of this county is generally undulating, being composed in the north and west of gradual slopes, which, in some portions assume the character of hills of moderate descent, and in the east, for the most part, gently rolling prairie. The lay of the land is to the south, and to this fact, no doubt, together with the protection given by the higher surrounding country on the north and east, is to be attributed the genial atmosphere so conducive to health that prevails throughout the year, moderating the severity of winter and winning back, at an early day, the birds of spring.

The soil is a rich alluvial loam, with a subsoil clayey and tenacious, and has an average depth of from 18 to 24 inches. The character of the subsoil, an important feature, is sufficiently porous to effect a natural drainage.

The report of the former State Geologist, Prof. Raphael Pumpelly, contains the following: "Probably no county in the State possesses superior advantages to Platte, it contains such a large quantity of rich land, is so well watered, and abounds also in good timber, including most kinds that are useful."

And, indeed, with a river front of about 60 miles on the Missouri, with the Platte river and its many creeks running through the entire county, it may well be said to be well watered, affording a never-failing supply of water for all purposes, including many excellent sites for water-power.

About one-half of the county is covered with timber, embracing every variety indigenous to this latitude.

No minerals have, as yet, been discovered, but it is believed that coal will be found.

The county had, in 1870, 112,237 acres of improved land; 102,286 acres of woodland, and 4,288 acres of other unimproved lands. Improved lands command, on an average, about $30 per acre; unimproved lands $15 per acre, and prairie lands about $20 per acre.

Platte county offers an excellent field for manufacturers, having inexhaustible supplies of building stone, timber, water-power, and centrality of position with regard to the far west.

The manufactories consist of ten flouring-mills; thirteen saw-mills; five distilleries, and a first-class furniture manufactory.

The leading occupation of the 17,352 inhabitants, (census 1870,) is agriculture.

The staple productions are corn, oats, rye, wheat, potatoes, timothy, clover, hemp, and tobacco, which all yield a high average. Blue grass is the principal pasturage grass in the county, growing spontaneously wherever the timber has been thinned out. Timothy, red clover, and all other grasses succeed admirably. The county being so well adapted to stock-raising, much interest has been taken in the introduction of fine stock, and great improvements have been already made in the native breeds, Berkshire, Essex, Suffolk and chester-white breeds of swine; short-horned cattle, Southdown, Cotswold and Merino sheep can be found on many farms. Great numbers of neat cattle, swine, horses and mules, are annually shipped to St. Joseph, Chicago, Leavenworth and Kansas City. The county possesses, besides the Missouri river, 75 miles of railroad, supplying all needed facilities for transportation. About four-fifths of the county is under fence and in cultivation. The finest fruit-growing country is found in that great central belt or region, which extends from the thirtieth to almost the fortieth degree of north latitude, and of this region Platte county forms the very heart. Hence, fruits of every kind and of the most delicious flavor are produced in abundance, but chiefly the apple, pear, and the downy-cheeked peach. The numerous fine orchards in the county have been a prolific source of revenue. Cherries, plums, apricots and nectarines, besides the many varieties of small fruit repay, with equal usury, the capital and labor invested. The culture of the grape has not, as yet, received that degree of attention which the uncommon adaptability of the soil should warrant. The sunny bluffs on the western boundary, are excellent for viticulture. There has been considerable immigration to this county since the war, and more emigrants of every class are wanted, the laborer, the mechanic, the merchant, the farmer and the manufacturer, all will find here a good home.

POLK COUNTY.

This county forms a part of that section of the State known as Southwest Missouri. It was organized March 13, 1835. The general surface of it is undulating, but broken along the water-courses. Less than one-sixth of the county is in cultivation; four-sixths is timber and the remainder prairies—large and small—very fertile, and well diversified. The finest timber is along the streams, and consists of hickory, oak, elm, walnut, cherry, maple and sycamore. Much of the upland timber consists of the different varieties of the oak, of a stunted growth—perhaps partially attributable to the fires that have swept through them. Much of the county that was once prairie has grown up in this stunted timber. The soil is generally rich and productive, and is classed as white ash, black loam and red clay, the latter being well adapted to the raising of wheat. The county is well watered by clear and rapid streams, which afford abundant water for stock and also water-power for mills. Springs are numerous, and excellent water can be had at most any point by sinking wells from 15 to 30 feet. The climate is mild and healthful. There are indications of iron, lead, sulphate of zinc and coal, but it is not known whether they exist in paying quantities. The county has eight or ten flouring-mills and about the same number of saw-mills; one woolen factory, and several cotton-gins and carding machines. The county had, in 1870, 74,680 acres of improved land; 175,519 acres of woodland, besides 24,391 acres of other unimproved land. The price of land, both improved and unimproved, has greatly depreciated within the last two years, and they are at present about the same as before the war. The price of so termed improved land is about $12; of unimproved, $5; of unimproved prairie and bottom land, $7 to $7.50, and of upland timber, $3 per acre. The leading occupation of the 12,445 inhabitants (census 1870) is agriculture. The principal agricultural staples are wheat, corn, hay, oats and potatoes, rye, tobacco, cotton, broom-corn, sorghum and sweet potatoes, of which wheat and tobacco are exported. With proper attention, clover and timothy do well, and are now cultivated to some extent. Some interest is being manifested in the improvement of cattle and hogs. A considerable number of neat stock and hogs are marketed annually. Sheep-raising is profitable, and would be more so if fewer dogs were raised. A stock law seems not to be acceptable to a majority of the farmers at present. Rails are mostly used for fencing, and timber is abundant for the purpose. Osage orange, properly cared for, has been tried successfully for fences. Fruit-raising has also been tried with complete success, and the interest in that direction is growing. But little wine is made as yet, and there are only about 40 or 50 acres planted in grape-vines. Springfield is the grain market. Most of the mules and horses are driven South, finding a ready market in the cotton States. The cattle are mostly shipped to St. Louis. After the close of the "civil difficulties" there was some immigration to Polk county, which increased till about 1871, since which time it has almost ceased. Most of it came from Ohio, Illinois and the Eastern States. With a mild and healthy climate, a productive soil and cheap lands, the county offers inducements to all emigrants in search of a home.

PULASKI COUNTY.

This county is situated in the central part of the State, but is generally classed as a part of Southwest Missouri. It was organized December 15, 1818. The surface is broken, being hilly in some parts, containing flat ridges in others, and has wide, rich bottoms along its streams. Most of the county is timberland, there being only a few prairie valleys. The soil along the streams is very fertile, producing corn equal to the best prairies of Illinois. The uplands are better adapted to raising small grain, fruit and grapes. The county is well watered by many streams, principally by the Gasconade, Roubideaux and Big Piney rivers, affording also some fine water-power for grist-mills. Timber is sufficiently abundant to supply all reasonable future demands. The mineral resources of the county are as yet not developed, but evidences of mineral deposits are everywhere visible. Iron and lead are both found, and a few banks of the former have been opened. There are very few manufactories in the county at present, comprising only some flouring-mills—both water and steam. The county had, in 1870, 15,148 acres of improved land; 44,894 acres of woodland, besides 962 acres of other unimproved land. The average price of improved farms is about $10 to $15; of unimproved uplands, $3 to $4; and unimproved bottom-lands, $6 to $8 per acre. Of the 4,714 inhabitants (census 1870) the majority pursue agriculture. The agricultural staples are corn, wheat and oats. The commodities for export are chiefly wheat, cattle and hogs. Blue grass grows very well but is not raised to any extent for pasturage; neither is clover or timothy. The whole unfenced territory is, during three-fourths of the year, an unbroken sward, and even the flint-clad hillsides are carpeted with a luxuriant growth of wild grasses, explaining clearly the fact that people generally do not want a stock law. Some improved breeds of stock have been introduced, but only to a limited extent. Sheep-raising would be profitable, since the county is so well adapted to it, were it not for the multitudes of utterly worthless and sheep-killing curs with which the county is infested. Strange, but true. Rail fences are mostly used, there being plenty of timber for that purpose. Hedges have hardly been tried. Fruits of all kinds do well, but are not cultivated to such an extent as the adaptability of the soil seems to warrant. Viticulture is still in its infancy, but grape-vines do very well wherever they have been tried. The A. & P. R. R. runs through the county and affords the necessary facilities for transportation to St. Louis, which is the principal market. Immigration has come in slowly since the war from Indiana, Illinois, Kentucky, and other States—mostly of the farming class.

PUTNAM COUNTY.

This county is situated in the extreme northern part of the State, bordering on the State line of Iowa, and was organized February 28, 1845. It is one of the counties bounded on the north by the famous Mason and Dixon's line. The county is crossed from North to South by the Medicine creek, and many other creeks (look at map), affording all the necessary water. The eastern half of the county is mostly timber, with a broken, uneven surface; the soil is of average fertility, when brought under cultivation. The western half is similar to the eastern in the conformation of the surface; but prairie predominates, and the timber is confined to the creek bottoms, and deep ravines in their immediate vicinity. Water-power is not used for any purpose in the western half, and but little in the eastern; steam-power is mostly used. The timber will not be adequate to supply the demand for a great number of years, if railroad building should be prosecuted with the same vigor as in the States east of the Mississipppi river. No minerals, except bituminous coal, are mined at present, and that only to a limited extent, for blacksmithing. There are now only two flouring-mills of any extent in the county. The county had, in 1870, 79,965 acres of improved land; 88,009 acres of woodland, besides 42,038 acres of other unimproved land. The price for improved farms ranges from $10 to $30 per acre, according to situation and quality; for unimproved, from $8 to $15 per acre; bottom and timberland is somewhat higher. The number of inhabitants, in 1870, was 11,217, whose leading occupation is agriculture. Stock-raising is the leading, and overshadows all other interests; and stock, in some form or another, is the article of export. Corn, wheat, oats, etc., yield a good average yield. Tame grasses are but little raised, the pasture being mostly obtained on the range. Blue grass is slowly taking the place of the native grasses all over the county. Improved breeds of cattle have been introduced quite successfully. Dogs and wolves do their best to keep the sheep from increasing so fast; but, with proper care, sheep-raising is as profitable as any branch of husbandry. The people have not considered a stock law as much as it ought to be, and a vote to-day would not express an intelligent opinion upon that subject. The cost of fences is about $1.50 per rod, and the repairs on the same, for 16 years, will equal the interest on the original sum. There are a few successful fruit-raisers in this county, but no large orchards and vineyards as yet. The C. B. & S. W. R. R. crosses the county near its centre; and other facilities are found in southern Iowa. They are all Chicago roads; and most of the produce and stock finds a market at that city. Immigration has been quite small; mostly farmers from Illinois, Indiana and Ohio—a very desirable element.

RALLS COUNTY.

Ralls county is situated on the Mississippi river, in the eastern part of the State. It may be termed an old settled county, when compared with most of the western counties, and was organized from part of Pike county, November 16, 1820. About three-eighths of the county is prairie, and the rest timberland. The eastern portion of the county is undulating and broken. The bottom lands, with alluvial soil of the richest quality, are of considerable breadth; next in quality is the "elm-land," which is sufficiently undulating for a natural drainage, but not broken or hilly; next in point of fertility, for general crops, comes the "white oak land," considered the best wheat-land, especially where a subsoil of red clay predominates. The prairies are less adapted to the raising of stock and grasses. The county is principally watered by the Salt river, a sluggish stream, meandering through the whole length of the county, from west to east, and its numerous tributaries, which afford, with the springs, all the necessary water for farm and stock; but little or no water-power. Timber is still abundant, for all present and future demands. Coal is found in the southeastern part of the county, and is mined to a limited extent, supplying the local demands, and considerable quantities being also hauled to Hannibal. Mineral paint and potter's clay, of good quality, are also found. The mineral resources have not been developed to any great extent at present, but will prove a source of revenue in the future. The county had, in 1870, 94,794 acres of improved land; 73,216 acres of woodland, and 11,735 acres of other unimproved land. Improved and cleared bottom land is worth from $16 to $40; unimproved from $6 to $14; elm-lands, improved, from $20 to $60; white oak lands, improved, from $6 to 40; improved prairie, from $10 to 30, and unimproved prairie from $6 to $15 per acre. The leading occupation of the 10,510 inhabitants (1870) is agriculture, there being not many manufacturing establishments in the county—comprising eight flouring-mills, ten saw-mills, one distillery, one wagon-shop and three plow factories. The principal agricultural staples are wheat, corn, rye, oats, hay, tobacco, fruits and stock; corn, wheat, tobacco and stock, form the commodities for export. The average yield of the cereals is good, except in such extremely dry seasons as that of 1874. The grasses flourish on the prairies; and blue grass seems to be perfectly at home, steadily taking the place of the coarser kinds when trampled out, and it is destined to become one of the greatest sources of wealth—never failing to make a crop for winter use, if the stock is kept off during the growing season. Improved stock of all kinds have been introduced, and much of the stock is more or less blooded. Sheep husbandry is very profitable, with a loaded gun ready for every dog prowling about unattended by his owner. With fine grazing on the prairies and bottoms, a stock law is not wanted by a majority of the farmers. Rail fences are mostly in use, the rails costing about $25 per thousand in the woods. Hedges have been tried with great success and are grown now to some extent. Orchards and vineyards do well, and produce abundantly; apples seldom fail. The St. Jo. R. R. has four miles, the M. K. & T. R. R. fifteen miles of track in the northern part of the county; the C. & A. R. R. runs through the east central part, and the M. V. & W. R. R. is in process of construction in the eastern part, having eighteen miles of track graded. Hannibal, Chicago and St. Louis are the leading markets. Only a limited influx of immigration has come to this county since the war.

RANDOLPH COUNTY.

This county, organized January 22, 1829, lies between the Mississippi and Missouri rivers, in the northeast central part of the State. Grand Prairie extends through the county, nearly central, north and south, and forms a part of the divide between these rivers. The water-courses, heading mostly in the edges of the prairie, run from the west side to the Missouri, and from the east side to the Mississippi. Besides the east fork of the Chariton river, running through the western, and Salt river, running through the northeastern part, there are many other large and small creeks, lakes and ponds, which afford all the necessary water for stock. The surface of the county is about equally divided in prairie and woodland. The former is generally level, with a few places on which the water collects, but they are generally sufficiently rolling to have a natural drainage. Part of the timbered land is broken, with thin soil, while a large portion is beautifully undulating and interspersed with small prairies, having a rich soil. The soil, except on the woodland ridges, is from one to three feet deep, and adapted to the growth of nearly all the agricultural products of the country. Timber of the best qualities of oak, maple, walnut, elm, hickory, cottonwood, ash, hackberry, etc., is well distributed over the county, and in abundance for agricultural and manufacturing purposes. Coal is found nearly all over the county; the main vein is four feet thick, and ranges from 60 to 100 feet deep; it is bituminous and equal to any in the State. Large quantities of it are shipped to other places. There are two shafts near Renick, one south of Higbee, one near Jacksonville, besides a large number of banks, employing from 500 to 600 operatives. There are also some good quarries in operation, furnishing fine building stone. Slate, fire-brick clay, potter's clay and brick clay abound. Manufactories are beginning to take a start, and several steam flouring-mills are located in Huntsville, Moberly and Renick, besides many smaller ones; saw-mills, woolen-factories, and steam agricultural works are also in the county. The census of 1870 gives 163,991 acres of improved land; 105,555 acres of woodland, and 399 acres of other unimproved land. Improved land is worth from $10 to $100 per acre; unimproved, from $5 to $25 per acre, governed by quality, location and improvement. The price of land has not advanced since the war, except near the cities. Many of the farms were very large, and the owners refused to cut them up for sale until within the last year or two, so that there are now good opportunities for new-comers to purchase in either large or small quantities, and on favorable terms. The leading occupation of the 15,908 inhabitants (census 1870), is agriculture. The principal products are corn, wheat, oats, rye, beans, potatoes, turnips, timothy, clover and Hungarian grass, all yielding very fair crops. This being a very large stock-raising and feeding county, very little of these agricultural productions are exported. The commercial crop is tobacco of a fine quality, of which large quantities are raised annually. Pastures are mostly composed of blue grass, which does remarkably well, having mostly taken the place of the native grasses. The prairies are well adapted to grazing, and furnish large crops of hay. Stock-raising being the leading business in Randolph county, much attention has been and is being given to the improvement of all classes of stock. Sheep do well, but the flocks are mostly small; reason, "dogs." Rail fences are mostly in use, and of late much attention has been paid to the culture of Osage orange for hedges. All kinds of fruits are successfully grown, and a good deal of attention has been paid to the culture of the better and best varieties. St. Louis is the principal market for cattle and hogs, and the South for mules and horses. The facilities for transportation are equal to any in the State, there being five lines running into the city of Moberly, near the center of the county. There has been quite an influx of immigration to this county during the last two years, amounting to many thousands, hailing from all parts of the United States.

RAY COUNTY.

Ray county is situated on the northern shore of the Missouri river, in the western part of the State. It was organized November 16, 1820. The county is about equally divided in timber and prairie, the former predominating in the southwestern and southern portions, and the latter in the eastern and northern parts. Several rivers and creeks traverse the county in various directions, of which the Crooked river is the most important, affording some little water-power. The county is well watered by these streams, which are all skirted with fine groves of timber, chiefly the different varieties of oak, walnut, hickory, hackberry, maple, ash, cottonwood, etc. Timber is abundant in some parts of the county, while others are almost denuded, especially near the larger prairies and along the line of railroads; though the latter traverse the most heavily timbered portions of the county, they are consuming the wood very fast. The soil is generally rich, consisting of a dark, productive loam. Bituminous coal of good quality is found; the stratum underlying a great part of the county is about two feet in thickness, and great quantities are mined at Camden and Richmond, employing about two hundred operatives. Indications of lead are also found. There are several flouring-mills and some other small manufacturing establishments in this county. The census of 1870 gives 136,790 acres of improved land; 79,368 acres of woodland, besides 75,976 acres of other unimproved land. The leading occupation of 18,700 inhabitants is agriculture, and the principal staples are wheat, corn, oats, barley, tobacco, rye, etc., and the commodities for export are flour, corn, oats, tobacco, hides, poultry, hogs, cattle and horses. Blue grass grows spontaneously wherever the prairie grass is killed out and the timber cleared off; tame grasses, clover, etc., also succeed well. Much attention has been paid to the introduction of improved stock, especially cattle and hogs. Sheep-raising is also very profitable, there being no wolves and but little injury is done by dogs. Rail fences are mostly used, and there is still plenty of timber for fencing purposes. Hedges, mostly of Osage orange, have been successfully raised to some extent. A stock law is wanted by the intelligent farmer, but the majority would probably oppose it. Comparatively little attention has been paid to fruit-culture, but fruits of all kinds adapted to this latitude succeed well. Considerable quantities of wine are made, and about sixty acres are planted in grapes. The county has good facilities for transportation, having, besides the Missouri river, two railroads, and a third one has been surveyed. St. Louis is the leading market. There has been considerable influx of immigration since the war, mostly from Iowa, Illinois and Ohio, together with some Germans.

REYNOLDS COUNTY.

This county is situated in southeastern Missouri, and was organized, February 25, 1845. The general surface of this county may be called rough and broken, with very fine farming lands along the rivers and creeks. The bottoms are very fertile, having a soil of rich, sandy loam, and there are many prairie valleys unsurpassed for their fertility. The hills, approaching the streams, often terminate in perpendicular bluffs, sometimes seventy-five feet in altitude. The water-courses are very abundant, and as clear as crystal, and some afford the most excellent water-power, surpassed by few counties in the State. Black river is one of the most beautiful streams, running through the county from northwest to southeast. Besides the numerous streams, which furnish all the necessary water for domestic use and for stock, innumerable springs are found everywhere, and some of them are powerful enough to furnish from 30 to 40 horse power, and that within a few rods of their source. Timber is quite abundant and of good quality, consisting of inexhaustible pine forests on the hill, oaks, hickory, walnut, etc. The county possesses many minerals, mostly yet undeveloped, but chiefly iron and lead—the former as hydrated oxide, red hematite, specular and manganese ores. One lead mine is in operation, and the ore contains a considerable percentage of silver. Of manufacturing establishments, it may be said that very little attention has been paid to them as yet, and they comprise only a few flouring and saw-mills. The county had, in 1870, 16,566 acres of improved land; 56,025 acres of woodland, and ——— acres of other unimproved land. The leading occupation of the 3,756 inhabitants (1870) is agriculture; and the principal staples are corn, wheat, oats, potatoes, rye and tobacco. Only the three first named are commodities for export. Of tame grasses, timothy, red-top and clover are mostly grown, and are very successful. Blue grass, though little cultivated, is doing very well. The soil is well adapted to the raising of tobacco, which is of superior quality—frequently bringing the highest market price if carefully prepared. It is grown to some extent. The county is excellent for stock-raising—there being an almost inexhaustible range, consisting of different varieties of grasses, and especially pea-vines, on which the stock fatttens during the greatest part of the year; without special attention or care. A stock law is, therefore, not wanted. But comparatively few improved breeds of animals have been introduced, but with fine success, and farmers are beginning to pay more attention to this important matter. Of hogs, the chester-whites have been introduced, and are crossed with the native, delicate kind. Sheep are very healthy, and sheep-husbandry is considered profitable. Although there are no large orchards in this county, most every farmer has planted more or less fruit trees, and with great success, and apples are principally grown. Of grapes, the same may be said—they are thrifty and bear abundantly. The county has, as yet, no railroads; the nearest to it is the St. L., I. M. & S. R. R., running through Iron and Wayne counties, along its eastern border, which facilitates communication with the market at St. Louis. Immigration is coming steadily to the county.

RIPLEY COUNTY.

This county is situated in the southeastern part of the State, and was organized January 5, 1833. Its surface is covered with hills and ridges, interspersed with river and creek bottom land, and so-called "flat-woods," lying between the Little Black and Current rivers. The soil of these flat-woods is very good, but not in the same degree as that in the numerous bottoms. The Current river, one of the finest streams in the State, runs almost through the center of the county, north and south, and along its shores are found very fine valleys of rich, alluvial soil, as well as some very hilly and poor land, often terminating abruptly. The many tributaries of this river afford immense water-power—equal, or rather superior, to any other county in the State. The water in these streams is as clear as crystal, and the home of immense numbers of excellent fish. Adjacent to all these streams are good bottom and valley lands. The land near these streams has many rough and stony hills, but after leaving the river and creek bluffs, the county becomes more level. The southern and southeastern parts of the county possess much the better soil—being a rich, sandy loam, and very fertile. The whole county was formerly covered with timber of the finest assortment for building and manufacturing purposes, and there is certainly no lack of it now. The northern half of the county is thickly set with excellent pines. There is an abundance of iron in this county—principally red hematite. Lead, silver and copper have also been found in small quantities, but no mines are, at present, in active operation. The county has two flouring mills, one on the Current river and one on the Little Black, besides some smaller mills; one woolen factory, and one plow and wagon shop. The county had, in 1870, 10,933 acres of improved land; 50,836 acres of woodland, besides 193 acres of other unimproved land. The price of improved land varies from $5 to $20 per acre, and bottom and tillable timberland, unimproved, from $2 to $5 per acre. The leading occupation of the 8,175 inhabitants (census 1870) is agriculture. The principal productions are corn, wheat, oats, cotton and tobacco. Cotton, tobacco and wheat are the commodities for export. The average yield of these, and of other cereals and fruits cultivated for domestic uses, is generally good; but not so for the year 1874, on account of the long-continued drouth. Cotton was formerly cultivated to a greater extent than now. Tobacco, for which the climate and soil are so well adapted, is the best paying crop—yielding from 1,000 to 1,200 pounds to the acre. There is yet an abundance of wild pastures. Blue grass finds this county so well adapted to its growth, that it spreads everywhere. Red-top and timothy produce very good yields. Thus far, comparatively little improvement in stock have been made, except in hogs. Disease in sheep is almost unknown, and they require to be fed only three months in the year. Dogs are also quite healthy, and more strychnine ought to be used to improve the otherwise well-paying sheep-husbandry. But few farmers desire, at present, a stock law. The cost of fences is low. Rail fences are generally in use, except in the overflowed bottom land, where picket fences are mostly used. Fruit trees are very healthy, bearing every year plenty of good and delicious fruits, and the area planted in orchards is fast increasing in size. Very little has, as yet, been done towards the raising of grape-vines, to the growth of which some parts of the county are extremely well adapted. The facilities for transportation are not the very best—the nearest railroad being some twenty miles distant. St. Louis is the principal market, although some live stock is driven to Memphis, Tennessee. Flatboats, on the Current river, are considerably used to bring the grain and live stock to the land of cotton. The immigration to this county has been small since the war, but steady—coming principally from Tennessee, Kentucky and Illinois. As soon as the proposed railroad is built, a greater influx of immigration is expected.

ST. CHARLES COUNTY.

This county is one of the oldest settled counties of Northern Missouri, and was organized December 14, 1818. It is situated in the eastern part of the State, separated from St. Louis county by the Missouri river, from the State of Illinois by the Mississippi river. The dividing land between these two largest rivers of North America is rolling, and in some places broken. About one-third of the county is prairie, of which the following are the principal ones; Point prairie, Dog prairie, Allen's prairie, Dardenne prairie and Howell's prairie. The first named prairie, extending from west and north of the Mamelles to Portage des Sioux, embraces a country unsurpassed in fertility. The Mamelles (the breasts,) are two smooth mounds, without trees or shrubs, and covered with grass, at an elevation of about 150 feet, and projecting from the main bluffs some distance into the prairie. They afford a most beautiful and extensive view. The long tongue of land for 20 miles above the mouth of the Missouri, varying from 2 to 10 miles in width, is composed of alluvial soil, and immensely productive. The timber-lands from St. Charles to the mouth of the Missouri river, are equally as good for farming purposes; they are nearly level, sloping gently towards the Mississippi river. Most of the upland prairies have also a good, but not deep soil, underlaid by a hard clay, and producing fine crops of corn, oats, hay, etc., and extremely well adapted to the raising of stock. The county is well watered by many rivers and creeks, affording but little water-power, but an abundant supply of water for stock and ample facilities for transportation of produce to market. Timber is still abundant in some portions of the county, but in others it is getting scarce. The oaks, hickory, walnut, maple, elm, cottonwood, sycamore, hackberry, locusts, etc., are the leading varieties of timber. Numerous beds of bituminous coal are found in this county, and several have been opened and are worked, supplying most of the demands of the City of St. Charles. Limestone, for building purposes and lime kilns, abound, and good sandstone is quarried in several places. Iron and lead have also been found, but not in paying quantities. Manufacturing establishments are increasing rapidly in numbers, and are already quite extensive, embracing six flouring-mills in the city, and seven in the county, all doing a lively business; two woolen-mills; six tobacco factories; two pork packing houses; a large furniture factory; a cheese factory; twelve saw-mills; twelve wagon factories; numerous cooper and blacksmith shops, and a large number of smaller industries. Gieseke & Bro., have a large establishment at Wentzville, making corn starch, grape sugar and glucose, the only manufactory of the kind in the United States. The county had, in 1870, 131,012 acres of improved land; 126,227 acres of woodland, besides 9,216 acres of other unimproved land. The price of land varies considerably, according to location, quality, improvement, etc., but may be stated at $30 to $100 per acre of improved farms in the eastern portion of the county, and $10 to $40 per acre, in the western; unimproved lands are sold at $3 to $10 per acre. The county had, in 1870, 21,304 inhabitants, whose leading occupation is agriculture. The principal staples are wheat, corn, oats, hay, barley, broom-corn, tobacco and hemp. Wheat, corn, oats, tobacco, fruit, and stock of all kinds form the commodities for export. The average yield is usually very large, of corn, forty-five bushels per acre, and of wheat, twenty to twenty-two bushels per acre. This county alone produces about one-eighth of all the wheat grown in the State. Blue grass is indigenous to the soil, and furnishes, with the other wild grasses, the pastures. As already mentioned, the county is well adapted to the raising of stock of all kinds, and great numbers are raised for market. Considerable improvement has taken place in the kind of stock, and the noble race of hogs of former years—no blood, but all nose—is fast disappearing. Sheep-raising is very profitable, but too many dogs are raised to please the sheep-raisers. A stock law is much desired and needed by a very great number of farmers, especially on the prairies. Rail fences are mostly in use, costing from $300 to $400 per mile. Osage orange hedges are planted with great success, and many miles of it are set out every year. The soil of the county is peculiarly well adapted to the growth of all kinds of fruits congenial to this latitude, and much attention has been paid to horticulture. St. Charles county is noted for the abundance and fine quality of its fruit, and especially of apples. About 400 acres are planted in grape-vines, and they produce annually very large yields of excellent grapes, and considerable wine is made, which finds a ready market. No county in the State has better facilities for transportation than this. Besides the two rivers, the "Father of Waters" and the "Big Muddy," there are several railroads completed and in process of construction. The St. L., K. C. & N. R. R., has 47 miles of track in the county, traversing it from east to west. St. Louis is the principal market, being only 20 miles distant, and connected by good macadamized roads. The influx of immigration has been slight during the last few years, consisting almost entirely of German farmers and mechanics.

ST. CLAIR COUNTY.

St. Clair county, organized January 29, 1841, is situated in the northeast of what is generally termed southwest Missouri. About three-fourths of the county is susceptible of cultivation, the other fourth is hilly and stony, principally in the eastern portion. The county is about equally divided between timber and prairie. Much of the former is bottom land, lying on the Osage and Sac rivers, and also on the margins of the smaller streams. The general surface may be called rolling. The two rivers mentioned furnish plenty of water-power for all practical purposes, and the numerous smaller streams water for stock. Timber is still abundant, of good quality, and much more so than thirty years ago, notwithstanding it has been used unsparingly since the first settlements were made. The climate is mild, pleasant and healthy, through a very large part of the year. There are quite a number of sulphur springs in various localities throughout the county, some are said to possess excellent medicinal properties, for instance: the noted Monagau Springs. Of minerals, only coal has been discovered as yet, mostly bituminous of good quality; there are also strong indications of other minerals, principally lead and iron, only awaiting capital to be developed. The manufacturing establishments of this county comprise three first-class flouring-mills, and about five saw and grist mills; notwithstanding all the excellent water-power, only two of the above are propelled by water. The census of 1870 gives 45,492 acres of improved land; 44,628 acres of woodland; besides 25,757 acres of other unimproved land. The average price of improved farms ranges from $10 to $20; of unimproved prairie from $3 to $5; and of bottom land from $5 to $8 per acre. These low prices are accounted for by many reasons already mentioned in the description of other counties. The number of inhabitants is 6,742, (censns 1870,) of which most are employed with farming. The agricultural staples are wheat and corn; wheat is exported, corn fed to cattle and hogs and marketed in this shape. The average yield of these and of other crops in 1874, is considerably below the average, caused by the drouth of that year and the ravages of the Chinch Bug. The prairies form the natural pastures of this county. Blue grass is slowly, but steadily, taking the place of the wild grasses. The people are just commencing to take a more lively interest in the improvement of their stock. A stock law is at present not wanted by a majority of the farmers. Rail fences are mostly used, being the cheapest; some hedging is also done, and with good results, if properly done, and well cared for. Fruit-raising, to which the soil and climate is so well adapted, is coming in favor, and fruits of all kinds, including the grape, are successfully grown. The facilities for markets are the Osage river, on which considerable shipping is done at certain seasons of the year, and the M. K. & T. R. R. The principal market for the surplus productions and the cattle and hogs is St. Louis. The county received an average amount of the emigration going west, principally farmers from Iowa, Illinois and Indiana. Lands are cheap, the climate is mild and healthy, and the thousands of acres that now lie idle, invite working men who are seeking a home.

ST. FRANCOIS COUNTY.

This county is situated in the southeastern part of the State, and was organized December 19, 1821. The surface is broken and hilly, for the most part, and in many places the scenery is picturesque and sublimely beautiful, the diversified landscape presenting much to interest the lover of nature. The county is not exclusively a farming county, the occupation of the people being as much diversified as the surface of the county. Notwithstanding there are many hills, and not a few deserving the name of mountain, there is yet a considerable portion of very fine farming land, as good as there is in the State. The county is emphatically a timber county, there being no prairie. The soil is well adapted to the growth of corn, wheat, oats, rye, and the different grasses. Big river, Flat river, and the St. Francois river, run through the county, besides numberless creeks, many of them affording water the year round for any kind of machinery. The timber is sufficiently plenty to insure no trouble on that score for many years. Iron and lead are the chief minerals found. As to iron, it may be safely stated that nowhere in the world, more or better ores can be found, and that there is enough, in this single county, to supply the world for a thousand years. The Iron Mountain has a world-wide fame, being the greatest accumulation of iron found in the same space. Three large furnaces are in operation. The operatives, including colliers, miners, etc., number about 2,500 persons. Lead is found in great abundance in various parts of the county, and is most successfully worked at the St. Joe mines, where five furnaces are running, having produced twelve million pounds of good lead from one acre, and they have nine hundred acres more to work, when the bottom of the first is reached. The county had, in 1870, 41,946 acres of improved land; 3,017 acres of woodland, besides 102,821 acres of other unimproved land. The average price of ridge land is about $10 per acre; timberland—that is, land worth nothing, except for the timber—can be bought at an average of $5 per acre; and bottom and fine upland will bring from $20 to $50 per acre. Mineral lands are, of course, much higher. The county possesses 7 flouring-mills; 8 saw, and 2 planing-mills. Farming implements are manufactured on a small scale. The leading occupation of the 9,742 inhabitants is, as already stated, mining and agriculture. The leading agricultural staples are wheat, oats and hay. These productions are mostly consumed in the county. Tobacco grows well, but is not cultivated to any extent. Blue grass and clover, which grow well, are mostly used for pasturage. Herd grass and timothy are mostly used for hay. Quite a number of neat cattle, hogs, mules and horses, are annually shipped to market. The county has some very good cattle, but the scrub variety is, as yet, predominating. A stock law is not wanted by the majority of the farmers. Timber is cheap, and abundant for fencing purposes. Most fences are made of rails, but farmers are beginning to use plank also. Osage orange hedges have been tried, to a limited extent, and do well. There are some large and old orchards in this county, which do very well on the high table-land, hardly ever failing to produce a good crop, but do not succeed on the bottom and low-lands. Only very few vineyards are to be found. The St. Louis and Iron Mountain R. R., furnishes the facilities of transportation of the mining and agricultural products to market. Immigration, at present, is at a stand-still, but shortly after the war, there was quite an influx of it, comprising emigrants from all parts of the United States and Europe.

STE. GENEVIEVE COUNTY.

This county, one of the oldest in the State, having been settled long before the Louisiana purchase, was reduced to its present limits in 1820. It is situated on the Mississippi river, which forms the eastern and northeastern boundary. The county is traversed by a number of small streams, and its surface is rather hilly. The land adjacent to the river, forms into a number of high and rugged cliffs. The land on either side of the streams is also hilly, and covered with rock. Between these hills are small valleys, rendered fertile by alluvial washing. The western part of the county is more level, rising in low hills, with scarcely any valleys, and is covered with heavy timber, sufficient for all demands. The oaks and hickory predominate. The soil on the hills is a clay loam, forming the wheat land. The bottoms have a rich, sandy, alluvial soil, excellent for the raising of corn. In the forests among the hills along the river, the most luxuriant growth of wild grasses is found, making it an excellent country for sheep-husbandry, though at present only few flocks are found, owing to wolves and dogs. The mineral resources of the county are not developed as yet. Lead has been found in several places, near the surface, and the mine Avon has been successfully worked. White marble is found in great abundance, below the city of Ste. Genevieve, of a superior quality, and great quantities are shipped to different points, some of it being used on the custom-house in St. Louis. Excellent limestone, granite, and the celebrated Ste. Genevieve sandstone abound. White sand, almost pure silicate, is also found in abundance, and large quantities of it are shipped to Pittsburg and other places, for the manufacture of glass. The census of 1870 gives 37,221 acres of improved land; 120,027 acres of woodland, and 105 acres of other unimproved land. It is difficult to arrive at a correct average price of the land, but for well improved farms, $8 to $10 per acre will not be far from the mark, though some will run as high as $40 and $50 per acre. The leading occupation of the 8,384 inhabitants (census 1870) is agriculture, there being in this county only 5 large and 1 small steam flouring-mills; three water-mills; 1 stave factory, and 4 saw-mills. The principal agricultural crop is wheat; also forming the chief article of export. Corn, oats, potatoes, tobacco, sorghum and hay, are also raised, and yield well, but not to a very great extent. The stock of the county is mostly the common native one. Improved breeds have been successfully tried, and it is expected that that a greater interest will be manifested hereafter in the raising of improved breeds. A stock law is not wanted, the county being at present not suited to its adoption. Orchards are numerous, most every farmer having one, producing fruit enough to supply the demand. The high river hills seem to be well adapted to the growth of the grape. The Mississippi river affords the only, but good means of transportation to markets. What are wanted by the people of this county are enterprising men, with a sufficient capital to develop the mineral and other resources.

ST. LOUIS COUNTY.

St. Louis is situated in the eastern part of the State; is bounded north by the Missouri river, east by the Mississippi river, and south by the Meramec river; this county is one of the five original districts of which the State of Missouri was formed. Its general topography may be termed undulating, though almost every variety of surface is found within its border, from the dead level to the highest hills—not to say mountains—and the steepest declivities. The banks of the Mississippi, except a short distance above the city of St. Louis, where the banks are subject to inundation, are high and rocky, and towards the interior the country becomes more level. The soil is of course equally various, ranging from the rich alluvial river bottoms, and the magnificent valleys of the Florisant, unequalled in fertility, to the steep and rocky hills of the western part, some of which are absolutely sterile. Rich and productive bottoms are found on many streams, such as have been already mentioned, and also on the river Des Peres. The interior of the county is well watered by the tributaries and sub-tributaries of these rivers. In earlier times the county was well timbered, though possessing some prairies of great beauty, but now, excepting in the extreme western portion, timber has become rather scarce, fully one-half of it being cleared off and destroyed. Coal is found and mined for many years near the city, and there are also indications of it in several other parts of the county. Iron and lead occur in the western part, but whether in paying quantities is doubtful. The fine, close, compact limestone, closely approaching marble, found near Glencoe, is extensively quarried. The so-called St. Louis limestone, of a grayish blue color, very durable, is also extensively used for macadamizing the streets and for building purposes. In Cheltenham, and other places near the city, fire and other valuable clays are worked to a great extent into fire-brick, tiles, pipes, flues, etc. The manufacturing interests are the most important in the whole West. The U. S. census of 1870 gives the following: Number of establishments, 4,579; number of steam engines, 425, with 15,118 horse-power; number of hands employed, 40,856; capital invested, $60,357,000; wages paid, $24,220,717; materials, $87,388,252; products, $158,761,013. Well known are the large iron-works in the southern part of the city, at Carondelet, and yet this vast industry is as yet in its infancy. The county had, in 1870, 132,556 acres of improved land; 79,386 acres of woodland, besides 3,108 acres of other unimproved land. It is difficult to give the average price of agricultural lands in this county, on account of the great and rapidly growing city that is a part of it. Distance from the city, character of soil and style of improvements have a great influence on prices, which range from $6,000 or $7,000 per acre, down as low as $10 or $15 per acre, in the more distant and less improved portions of the county. Taking the court house in St. Louis as a center, and striking a radius of 10 miles, the prices range from $500 to $7,000 per acre; extending the radius to 15 miles, the average price is $250, and for the remainder, $75 per acre. The leading occupation of the 351,189 inhabitants, exclusive of the city, which contained in 1870, 310,864 citizens, is agriculture. The leading staples are corn, wheat, hay, oats and fruit, but within a radius of 15 or more miles from the city, garden vegetables, fruits, dairy products and hay, are the principal productions. Blue grass, clover, red-top, orchard grass and timothy are grown for pastures, with good success; timothy and red-top mostly for meadows. Great numbers of horses, mules, sheep, hogs and cattle are raised for market, and much attention has been given to improved breeds of all these animals, and with gratifying success. A stock law is now in operation in this county. Plank fences are mostly used, costing about $2 per rod; in the extreme western part of the county rail fences are still extensively used. The county possesses many fine and large commercial orchards, and they most invariably yield large crops of excellent fruit. Much attention has also been paid to viticulture, and considerable quantities of wine are produced annually. There are quite a number of large nurseries in this county, which have been long established and are favorably known as reliable establishments.

SALINE COUNTY.

This county is situated in the northwest central part of the State, bounded on the north by the Missouri river, and was organized from Cooper county November 25, 1820, and its boundaries were established January 12, 1829. Along the above named river are the celebrated bottoms, famed for their rich alluvial soil and great productiveness, ranging from one to four miles in width, and which are very densely covered with fine timber. Back of these bottoms are the rugged, irregular bluffs, some of which are very precipitous—for instance, the Devil's Backbone. These bluffs afford a beautiful view of the Petit Osage Plain, situated in the northwestern part of the county, about 80 feet above the level of the river, and with a very fertile soil. The outer portion of it is undulating, insuring a good natural drainage, while the center is somewhat depressed. The remainder of the county is mostly undulating prairie, well watered by many streams, which are skirted with timber of good quality of such varieties as grow in this latitude, and there is more timber in the county now than formerly—enough to supply all reasonable present and future demands. The soil is deep and rich, with a slight admixture of sand in the western part, and is underlaid with a porous subsoil, and will never wear out with a proper rotation of crops. The county is well watered by many streams, which, however, furnish but little water-power, and by many fresh and salt water springs. Salt was manufactured formerly in a rude way in many localities, and capital and enterprise will certainly make these springs ultimately a source of great wealth. Some mineral springs, remarkable for their medicinal properties, are also found in this county. There are some fine deposits of cannel coal near Arrow Rock, and also lead and iron, which are successfully mined. Bituminous coal occurs in nearly every portion of the county. Sandstone of fine quality is found in many localities, and also limestone, susceptible of a fine polish, is quarried at Miami. The county had, in 1870, 200,799 acres of improved land; 88,190 acres of woodland, and 37,215 acres of other unimproved land. The leading occupation of the 21,672 inhabitants is agriculture. Corn and wheat are the leading staples, formerly also hemp, and the soil is well adapted to all kinds of cereals, vegetables and fruit, yielding very large crops. Tobacco is cultivated to some extent, principally on the bluff lands, which are peculiarly well adapted for its growth. The tame grasses are extensively grown and do well. Great attention has been paid to stock-raising, which is the leading industry, and a great number of neat stock are raised for market. Large numbers of cattle are brought from Texas and Colorado to be fed through the winter. But little can be said of the manufacturing interests of Saline county, which are at present very limited, comprising only a few shops and grist-mills, one woolen-mill and one shingle factory. The means of transportation are furnished by the Lexington Branch of the M. P. R. R., which has 7½ miles in the southwestern corner of the county.

SCHUYLER COUNTY.

The county is situated in the northern part of the State on the Iowa State line, and was organized February 14, 1845. The county is about equally divided between prairie and timber. The general surface is undulating and rolling, and the land lying between the Chariton river and the dividing ridges from three to five miles in width, is rather broken and densely covered with timber. This river, separating the county on the west from Putnam county, runs through a very productive alluvial bottom, connected with level or gently undulating prairies, and affords good water-power, however, little used on account of the difficulties occasioned by the unstableness of the banks. Three other streams running through the county afford stock water, and are bordered with fertile, heavy timbered bottoms. The divides between them are mainly level prairies, well adapted to cereals and grasses. Timber is still abundant, and of good quality, and will, with proper care, be adequate for all future demands. The soil is mostly a black loam, underlaid with yellow clay, with occasional streaks of fine white sand, through which water drains naturally. Bituminous coal is found in abundance, but principally so in the western part of the county, in veins varying from one to four and a half feet in thickness, and about ten banks are mined, employing about two hundred operatives. Evidences of lead and traces of copper have also been found, and also potters' clay, lime and sandstone. The manufacturing interest are confined to several flouring-mills, one woolen factory, one foundry and machine shop, one cheese factory, two wagon manufactories and one broom factory. The county had, in 1870, 54,561 acres of improved land; 67,382 acres of woodland, and 21,241 acres of other unimproved land. The average price of improved land is about $12 to $15 and of unimproved land, $8 per acre. The leading occupation of the 8,820 inhabitants (census 1870,) is agriculture, and the principal staples are corn, cattle, hogs, hay, mules, sheep, horses, oats, rye, wheat, tobacco, etc., of which hogs, cattle, hay, mules, horses, sheep, and oats are exported. Less tobacco is raised now than before the war; the soil in some portions of the county is well adapted to raise the best quality of it. Timothy and blue grass are extensively grown, and succeed well; the former is a profitable crop for making hay for export.

Considerable numbers of stock of all kinds are raised for market, and farmers are paying some attention to the improvement of stock. The rail fence, costing about $1 per rod, is principally used. A stock law is not wanted by a majority of the people. Much attention has been paid to the raising of fruit of all kinds, including the small fruits and the grape, and farmers are very successful—almost always sure of an abundant crop. The county has good railroad facilities, viz.: The St. L. K. City & N. R. R. and the M., T. & N. R. R., which have, together, about 46 miles of track, giving a direct communication with the cities of St. Louis and Chicago; the latter receives most of the exports. The county received a fair share of immigration since the war; but more is needed to settle on the cheap, fertile lands.

SCOTLAND COUNTY.

Scotland county, organized from part of Lewis county January 19, 1841, is situated on the Iowa line, in northeast Missouri. Its surface is diversified with rolling prairie, table and bottom land. The streams, six in number, all run in a southeasterly direction, affording the necessary water for stock. The timber skirting these streams is sufficient to supply the demand for fencing, building and fuel. The soil is what might be called a light, sandy loam, except in the bottoms, where it is very deep and black—measuring from two to ten feet, and yielding large crops of all kinds of produce. About one-half the land is prairie, and three-fourths of the whole is in cultivation. The climate is ordinarily mild and pleasant, but occasionally subject to extremes both in heat and cold. As yet, no minerals have been developed, but it is thought that coal does exist, and preparations are being made to sink a shaft. The health of this county cannot be too highly recommended. There are two large flouring-mills in the town of Memphis, and quite a number in other parts of the county, in which sawing is done and corn ground on stated days; also, one cheese factory; two small woolen factories, and one implement manufactory on a small scale. The county contained, in 1870, 109,447 acres of improved land; 78,088 acres of woodland, and 45,884 acres of other unimproved land. The price of improved farms varies from $20 to $40 per acre, and of unimproved land from $10 to $20 per acre. These prices have advanced since the close of the war. The leading occupation of the population (according to the census of 1870 there were 10,670 inhabitants) is agriculture. The leading agricultural staples are corn, oats, hay, wheat, rye and potatoes. The exports are principally oats, wheat, rye, potatoes, corn and hay, but most of the grain is being fed at home. The usual average yield (not of 1874) is, for corn, about 40 bushels per acre; oats, 25 bushels per acre; wheat, 15 bushels per acre; potatoes, 100 to 150 bushels per acre, and hay about 1½ tons per acre. Scotland county is too far north to cultivate cotton. But little tobacco is raised—only a few raising it for export. Other products are raised successfully in limited quantities. Blue grass is used to some extent for pasture, and it, as well as clover, grows luxuriantly. Considerable numbers of neat cattle, horses, mules, hogs and sheep are annually sent to market. Shorthorn cattle have been introduced, and also Berkshire, McGee, Poland and China hogs, and Cotswold and Southdown sheep—all with success. Sheep-raising is very profitable, the only enemy being the dog, which annually destroys vast numbers. A stock law is wanted only by a few. Rail and plank fences are mostly used, and Osage orange hedges have been largely planted since the war, and with decided success. The cost of fencing by rail is about $175 per mile, and the cost of repairs fully 10 per cent. Fruit-raising is a success, and principally of the small fruits, which yield largely. There are now a goodly number of orchards in the county, but only a few vineyards. The M. T. & N. and B. & S. W. R. Rs. furnish transportation. Chicago is the principal market for live stock, although Keokuk is also taking a great many of the hogs. The grain is mostly shipped to St. Louis, and east *via* Keokuk. There has been a large immigration from the Eastern and Middle States to this county.

SCOTT COUNTY.

This county is situated on the Mississippi river, in the southeastern part of the State. It was organized from a part of New Madrid county December 28, 1821. About one-half or a little more of the surface of this county is level or very little undulating, and four-fifths ot this portion is extremely fertile, producing corn, cotton, wheat, and all the grasses, and is also well adapted to the growth of peaches. More than one-third of the surface, and principally the northern part, is high and rolling, but not too steep to be susceptible of cultivation; in fact, nearly one-half of this hill land lies well for agricultural purposes. The principal streams are the East Fork of White Water, which forms part of the western boundary, and its tributary, Caney creek, in the northwestern part of the county. In the south central part is the St. John bayou. The soil, though poor in a few localities, is mostly excellent for farming, and principally so in the Mississippi bottoms, which extend from 3 to 5 miles back from the river. The county has a great variety of timber, chiefly the oak, beech, sweet gum, cypress, hackberry, etc. Sassafras often grows large enough to make twenty-four rails to the cut. Formerly nearly the entire surface of the county was covered with forests, and there is now enough left for all practical purposes. Of minerals, we must mention the apparently inexhaustible mines of yellow ochre—an excellent mineral paint, and worked profitably to some extent at present. In the northeastern part of the county are fine quarries of white marble and limestone, easily converted into lime. Iron and lead are thought to exist in the hills, while bog iron is found extensively in the swamps. Manufacturing establishments consist of one steam flouring-mill, with cooper-shop attached; two steam stave-factories, one pottery, one lime-kiln, several ochre-grinding machines, and nine steam saw-mills. This county contained, in 1870, 32,542 acres of improved land; 63,724 acres of woodland, besides —— acres of other unimproved land. About 62,000 acres of land are owned by Hon. Thomas Allen, who will soon, or does now, offer it for sale. The greater portion of it is very fertile. The leading occupation of the 7,317 inhabitants (census of 1870) is agriculture. The chief productions are wheat, corn, oats, barley, cotton, tobacco, potatoes and fruit. They all yield excellent average crops. The exports are principally wheat, oats, corn, cotton, staves, lumber, ochre, hogs and cattle. This county is well adapted to the growth of tame grasses. Timothy yields generally from 2,500 to 3,500 pounds per acre,. Very little blue grass has been sown, but it grows abundantly in the forests and commons. Clover is begining to be extensively grown as a fertilizer. Although this is doubtless one of the best stock-raising counties in the State, farmers have only of late turned their attention to this lucrative branch of agriculture, and improved breeds will soon take the place of the native stock. Quite a number of hogs are marketed annually. Some parts of the county are well adapted to fruit-culture, not being far behind St. Charles in its adaptability for this purpose, and farmers are just beginning to make it profitable, and young orchards are springing up everywhere. The facilities for transportation are the Mississippi river, 22 miles of the St. L., I. M. & S. R. R., passing through the center of the county from northwest to southeast, and two other railroads, passing near the northern and southern borders.

SHANNON COUNTY.

This county is situated in the southern part of the State, and was organized January 29, 1841. The southern portion of this county is high prairie land, interspersed with timber; it is not as well watered as the northern part, although fine springs with good water can be obtained by digging from 30 to 50 feet. The northern and central portions are generally broken, hilly and heavily timbered with the different kinds of oak, cedar and pine, and are well watered by many streams, but chiefly by the Current river, which enters the northwestern corner and flows in a southeastern direction across the county, and by its numerous tributaries. Most of the larger streams afford excellent water-power, and there are also some springs, which furnish power for mills, such as the one north of Pine Hill, which is 80 feet in width, and unfathomed as yet. Along all the streams is very fertile bottom land. The county is rich in minerals: large deposits of hematite and specular ores, lead ore, and beds of copper of a superior quality are found, and the old copper mines, near Eminence, are now successfully mined. Reports state that silver is also found in horn-blende and quartz rock, but has not yet been developed. The county contained in 1870, 8,404 acres of improved land; 50,851 acres of woodland, and 570 acres of other unimproved land. The price of land varies, according to locality and quality, but may be stated as quite low. The manufacturing interests are few, such as are generally found in a newly settled country, consisting of two flouring and three saw-mills, and the necessary number of blacksmith shops. The leading occupation of the inhabitants, 2,339, (census 1870,) is agriculture, and the leading staples are corn, wheat, rye, oats, potatoes and tobacco. The hillsides are admirably adapted to the culture of tobacco, fruit and the grape, which produce always large yields. Only a very small portion of the uplands are considered unproductive for all, except grapes, which grow very luxuriantly in the wild state, and producing largely. Stock-raising is also quite profitable, and some attention has already been paid to the improvement of the native scrub breed.

SHELBY COUNTY.

Shelby county is centrally located in what is denominated the Northeast, at the very doors of the cities of Quincy, Ill., and Hannibal, Mo. The surface of the county is very nearly equally divided between prairie and timber. The former is graded from level to quite rolling; the latter is principally oak, with a liberal sprinkling of other varieties of hard wood—such as walnut and hickory. The soil is very productive when properly cultivated, being a sandy clay loam, underlaid by what is generally known as hard-pan. There is no county in the State, perhaps, where manuring pays better; the strength of it is not lost as in more porous soils, but is retained near the roots to be appropriated by the plant. The principal stream is the North Fork of Salt river, running through the center of the county, diagonally, from northwest to southeast. This river and its tributaries afford only an uncertain water-power, and consequently steam is the main dependence, but furnish plenty of water for domestic use and stock. An inexhaustible supply of the finest soft water can be easily obtained with little time and labor, by digging stock ponds. Although timber has been extravagantly used, yet there is enough, with proper care, to meet future demands. There are several veins of coal, but they are not developed and worked. An inexhaustible supply of the best brick clay, and several beds of potters' clay are in this county, and are worked to a limited extent. Of manufacturing establishments, the county has four or five steam flouring-mills, with a sufficient capacity to manufacture all the wheat raised into flour; also, quite a number of saw-mills, and some wagon and plow-shops. The county had, in 1870, 77,849 acres of improved land; 61,445 acres of woodland, besides 21,134 acres of other unimproved land. Improved lands are worth from $7 to $50 per acre; unimproved lands from $5 to $15 per acre, according to location. Timberland, in the southwestern portion of the county, rates higher than prairie, but in other parts it is generally cheaper. The leading occupation of the population (10,119 in 1870) is agriculture. The staples are corn, hay, oats and wheat. Hay is getting to be quite an important article for export—the soil being well adapted to the raising of this important crop. Grain is mostly exported on the hoof, it being fed to stock. Tobacco is cultivated to a considerable extent along the water-courses and in the timbered districts, and is of good quality if properly handled. Timothy and clover mixed make very fine pastures on the prairie lands—yielding double as much grazing as any other grass. Blue grass is extensively cultivated for winter pastures, and is fast taking the place of the wild grasses. Farmers are learning that it pays to keep fewer and better stock on tame grass than to depend on outside grazing. Improved breeds of stock, of all kinds, have been introduced with great success, and great numbers are annually sold. The raising of sheep, both for mutton and wool, is profitable; but the numerous dogs are a great drawback to this important branch of stock-raising. The fence mostly in use is the rail or worm fence, but the first cost is considerable. The substantial and ornamental Osage orange hedge is a great success. Fruits of all kinds are successfully grown to some extent, as also the small fruits and the grape-vine. The H. & St. J. R. R. crosses the county from east to west, south of the center, and furnishes the only means of transportation. Chicago and Quincy are the principal markets; only a small portion of the produce goes to St. Louis. The population increased rapidly from the close of the war up to about 1871, since which time immigration has almost ceased. The greater number of immigrants came from the Northwestern States, representing most all classes, but farmers predominating.

STODDARD COUNTY.

It is situated in the southeastern part of the State, and was organized January 2, 1835. The surface of the county is very diversified. The uplands, embracing about one-third of the whole area, and which are situated in about the middle of the county from north to south, are mostly rolling, with a clay loam, underlaid with yellow or reddish sandy or gravelly clay, very fertile, well supplied with springs, and mostly adapted for farming; only a small portion of the uplands are broken and rocky. A narrow strip of prairie occurs in the southern part of the county. The bottom lands are mostly level—a few rolling—covered with a dense growth of timber, and have a very deep, sandy, alluvial soil, very productive, and are principally covered with cottonwood, sycamore, maple, cypress, etc. The county contains some so-called swamps, which probably are named thus because they are most always dry; only in very wet seasons this term may be applicable; but they are very easily drained. On some of these "lakes and swamps," which are so persistently located in this county, many of the finest farms are found. The Castor river, with its fertile banks, is the principal river, running through the county from northwest to southeast, and furnishes excellent water-power. Many other streams meander through it, which, with the immense number of fine springs, furnish all the necessary water for farm use. The surface of the county being almost entirely covered with timber, there is no lack of it for present and future demands. The mineral resources are not developed, but the county possesses large quantities of various minerals, such as iron, lead, zinc, nickel, copper, plumbago, ochre, kaolin, barytes, silver, etc.; brown hematite of iron, bog or limonite, iron ore and lead are prevalent. The climate is excellent, with short and mild winters, and very healthy. The manufactories of the county embrace ten mills—seven with steam-power, of which four are flouring and grist-mills and three saw-mills; seven cotton-gins and three wool-carding machines. The census of 1870 gives 36,646 acres of improved land; 99,891 acres of woodland, and 62,581 acres of other unimproved land. About 4,000 acres belong to the United States; 158,000 acres are claimed by the railroad, and 20,000 acres by another company. The price of land is very cheap. The leading occupation of the 8,535 inhabitants (1870) is agriculture; and the principal staples are cotton, wheat, peanuts, tobacco, hogs, hides, etc., which all form commodities for export in a larger or less degree. The land is unsurpassed for general farming purposes, and the yields are very large. Tobacco of good quality is grown to some extent in the western part of the county; but owning to tax restrictions is not as much grown as the adaptability of the soil for this purpose seems to warrant. Cotton is fast becoming the leading product; sorghum, peanuts—and principally the latter—are grown profitably. Comparatively few of the tame grasses are cultivated; and, on account of the fine ranges, a stock law is not wanted at present. Fencing material is abundant, and the rail fence is mostly in use, costing about 30 cents per rod. Quite a number of mules, cattle and hogs are sold annually; but only few improved breeds of animals have, as yet, been introduced, except the Poland-China and Berkshire hogs. Quite a number of small orchards have been planted since the war, in which the old ones were destroyed, and apples, pears, peaches and cherries produce well. Grapes are also successfully raised. The C. & P. B. Division of the St. L., I. M. & S. R. R. has 28 miles of track, and the T., M. & P. R. R. 16 miles graded in this county, furnishing ample means of transportation to markets. The immigration since the war has been mostly from Illinois and Tennessee, and certainly will increase if the resources of this county are better known.

STONE COUNTY.

Stone county is situated in the southwestern part of the State, bounded on the south by Arkansas. The general surface of the county is very broken, hilly, and almost mountainous, and is well timbered with hickory, oak, elm, maple, hackberry, box-elder, sycamore, ash and excellent pine. About one-half of the tillable land is bottom, and the other half upland. The bottoms are very productive, and the uplands well adapted to grazing and the growth of small fruits. The county is well supplied with streams and springs. White river flows in a tortuous course from west to east across the southern part of the county. The James Fork of White river meanders through the county from north to south. These rivers and their numerous tributaries furnish all the needed water, and also excellent water-power. On some of these streams a fall of 10 to 12 feet can readily be obtained, with level rock-beds and good banks. Both the White river and the James are declared navigable by engineers. The county contains many caves, some of wonderful beauty, rivaling, in many particulars, the far-famed Mammoth cave of Kentucky. The mineral resources are almost entirely undeveloped, but there are indications of iron, copper and lead, specimens of which lie scatted in many places over the surface, inviting development. A rich deposit of pumice stone of good quality is found near Galena. The county contained, in 1870, 11,744 acres of improved land; 19,997 acres of woodland, besides 186 acres of other unimproved land. The A. & P. R. R. Co. have about 140,000 acres of land for sale in this county, at prices ranging from $1 to $5 per acre. The leading occupation of the inhabitants is agriculture, and the crops usually produced in that portion of the State are all successfully and very profitably raised. But stock-raising is the most profitable pursuit of the farmer, as there is yet an unlimited extent of fine range and abundant water for stock. Fruits of all kinds do well, and the county is in many parts extremely well adapted to the growth of the grape. The A. & P. R. R. runs through the extreme northwest corner of the county.

SULLIVAN COUNTY.

This county, organized February 16, 1845, is situated in the northern part of the State. The general surface of the county is quite rolling, in some parts almost hilly, with about equal portions of timber and prairie. Not one-half of the county is at present under cultivation. The soil is a deep black loam on the prairies and on the creek bottoms. On the ridges it is a clay loam, well adapted to the growth of wheat. The county is well watered by many large and small creeks, affording, besides the water for domestic use and stock, some excellent sites for mills and power for other manufacturing purposes.

Timber is still plentiful for all purposes, and the coming growth will be sufficient for the future demands of the county. There are no minerals developed, except coal, which is mined on a small scale in four different places. The manufactures of the county consist in ten flouring-mills, about sixteen saw-mills, two potteries and three establishments making agricultural implements. The county had, in 1870, 89,435 acres of improved land; 108,146 acres of woodland, and 68,673 acres of other unimproved land. The average price of improved land is from $8 to $15, and of unimproved land, including all kinds, from $4 to $10 per acre. The number of inhabitants in 1870 was 11,907, whose leading occupation is agriculture. The principal agricultural staples are grass of all kinds, clover, corn, wheat, oats and rye. The chief commodities for export are wheat, corn, oats, and some rye. The average yield of 1874 was lower than usual on account of drouth. Tobacco is raised to some extent. Other cereals and fruits are raised to a limited extent, but only for domestic use. Blue grass, which succeeds admirably, is used to some extent for pasturage. Live stock is the leading business in this county, which is well adapted to this branch of agriculture. Considerable numbers of neat stock, horses, mules, hogs and sheep are annually raised for export. Comparatively little attention has been paid as yet to the introduction of improved breeds, except in hogs. Sheep-raising could be made very profitable, they being not molested by wolves, but of course there are too many dogs. A stock law is not wanted by a majority of the farmers, there being yet an excellent range. Fruits of all kinds adapted to this latitude succeed well. Grapes are cultivated—about 20 acres—and are also a success. The facilities for markets are at present not very good, but will soon be improved, there being a railroad in course of construction. The principal market for grain is St. Louis, and for live stock St. Louis and Chicago. There has been an increase of population by immigration since the war, mostly from Iowa, Wisconsin and other Eastern and Northern States.

TANEY COUNTY.

Taney county is situated in the southern part of the State, being bounded on the south by the State of Arkansas, and was organized January 5, 1837. It is one of the oldest, and was at one time the largest county in the State, but has been repeatedly cut down until its present dimension was reached. It lies on both sides of the White river, is rough and mountainous, with a most varied soil, and presents, in many locations, a most beautiful and picturesque scene, with its steep mountain peaks. The soil of the county may well be separated into three classes, viz.: The black alluvial soil in the river bottoms; the more sandy creek soil, but little inferior to the former; and the soil on the ridges, hills and table-lands, which is mostly a dark lime, underlaid with a red clay formation. The valleys are generally fertile, but mostly narrow. Timber is yet very abundant, and of good quality, the larger portion of the southern part of the county being covered with fine pines, sufficient to supply the whole Southwest Missouri with excellent building timber for many years to come. The county is well watered with many beautiful water-courses, with the clearest of water, and enlivened by great numbers of the finny tribe, by hundreds of fine springs, but chiefly by the above named river, which flows through the entire length of the county, from west to east, is navigable the entire season, and affords water-power for all ordinary machinery. The mineral resources are not yet developed, but rich deposits of lead and zinc are found in many places, principally in the southwestern portion. Hematite iron ores form mountains, and will soon be mined, and a small fleet of barges, for the purpose of shipping the ore, are now being built. Silver is also said to exist. The manufactures of the county may be said to be very few, consisting of flouring, saw and sorghum mills. The county had, in 1870, 11,376 acres of improved land; 26,052 acres of woodland, besides ——— acres of other unimproved land, and a population of 4,407, whose leading occupation is agriculture. Corn, wheat, oats, rye and potatoes are principally raised, yielding good average crops, but all other productions adapted to the climate are also successfully grown. Tobacco and cotton, both, grow well. The former is now cultivated to but a limited extent on account of the heavy tax, and the latter has been raised extensively. But little attention has been paid to the growing of tame grasses, which do well if tried, there being as yet an abundance of fine wild ranges, and consequently a stock law is not wanted, but so much more a law to prohibit the males of every species of stock to run at large, and another one to compel the owners of a large pack of dogs to pay for the privilege of keeping them. The county is well adapted to the raising of all kinds of stock, but principally for sheep-husbandry; but the aforesaid excellent breeds of yellow curs on the farms, and the wolves in the mountains, are a very serious drawback. Some improved animals, of different kinds, have been successfully introduced, so that the scrub breed will gradually disappear and make room for better kinds. The county, being well adapted to the growing of fruit of all kinds, including the grape, has some very fine orchards, and many are being planted. The county has at present no railroad facilities within its border. The surplus produce is shipped down White river in flatboats, and the live stock to Springfield, and from there to the principal market, St. Louis. About four-fifths of the present citizens of Taney county have gone there since the war, mostly from Iowa, Ohio, Illinois and other States, and Europe, and it is rapidly filling up with an industrious class.

TEXAS COUNTY.

This county is one of the largest counties in the State, and is situated in the southern part of the State; it was organized February 14, 1845. Being traversed by the Ozark Mountains, a great portion of its surface is broken, there being little or no prairie within its borders. The hills are generally covered with second growth of timber, consisting of the different varieties of oak and pines, only awaiting railroad facilities to be transferred to lumber and transported to market. The hillsides are mostly stony. The valleys along the streams are heavily timbered with sycamore, walnut, butternut, cottonwood, maple, etc., and wild grapes also grow in abundance. The soil is sandy, and very rich and fertile in the alluvial bottoms, well adapted to the growth of all kinds of crops. The bottom lands are the most productive, the valleys next, and last in quality the uplands, or so-called barrens. There is but one river large enough for good water-power, the Big Piney, so named on account of the pines growing in great abundance along its banks. The county is well watered by many creeks and numerous fine springs. Iron and lead are found in many places, and are sufficiently developed to show that they occur in paying quantities; no mines are at present in operation. Silver is also claimed to exist. Of manufacturing establishments there are only few; three steam flouring-mills; six or seven water-mills; some fifteen saw-mills, and two tobacco factories. The mills located on the Piney river saw, in the aggregate, over two million feet of lumber per annum, employing some 75 hands the year round, and twice that number during the winter. The county had, in 1870, 31,887 acres of improved land; 101,443 acres of woodland, besides 87,402 acres of other unimproved land; the number of inhabitants was 9,618, whose leading occupation is agriculture. The price of improved farms is from $7 to $10 per acre; of unimproved, from $1 to $5 per acre, and there is also plenty of vacant land left subject to entry under the homestead law. The leading products are corn, wheat, potatoes, etc.; exported are wheat, hogs, cattle, hides, lumber, shingles, etc. The average yield of corn per acre is 30 to 40 bushels; of wheat, 16 bushels; of oats, 35 to 40 bushels; of hay 1½ to 2½ tons, and of potatoes, 150 bushels. Tobacco is raised to quite a large extent, yielding from 1,000 to 1,200 pounds per acre. All tame grasses do well; timothy and red clover are raised for hay, and blue grass has found here its home. Wild grasses grow luxuriantly all over the face of the county, and are used as pastures by the farmers. The whole county being almost a pasture, a stock law is not wanted. Rail fences are mostly used, and an eight-rail fence costs about 25 cents per rod. The county is excellent as a stock-raising county, and many hogs, beef cattle, etc., are annually sold. Improved animals have been introduced, and are doing well, consisting of short-horn cattle, and Berkshire, Poland and Chester-white hogs. The loss by dogs and wolves among sheep is at least 7 per cent. per annum—mostly committed by dogs—but the wolves have usually to incur the blame. Farmers are turning their attention to fruit-growing, and many orchards have been planted during the last seasons, and the bearing orchards prove conclusively that this is a fruit-growing country. Grapes also do well, and yield abundantly. The county has no railroad facilities at present, the nearest being the A. & P. R. R. The nearest point by railroad is Rolla, which is also the principal market for the county. There has been a large influx of immigration to this county, mostly from the eastern and middle States.

VERNON COUNTY.

Vernon county is one of the fertile counties of the Southwest, destined ere long to be one of the most populous and wealthiest agricultural counties in the State. It was organized February 17, 1851. The surface is smooth, except in the southeastern part, which is somewhat broken. The timber and prairie are fairly proportioned throughout the entire county. The soil in the eastern part is of a rich sandy character; in the middle and western parts it is called "black limestone" or "mound land." The rivers narrow, with deep channels, and are principally the Marmaton, Big and Little Osage. Creeks are numerous and are generally well timbered, affording an abundance of water for stock, and in many places in the county superior advantages for manufacturing are to be found. Timber is plenty for all practical purposes, the demand for fencing decreasing yearly, as hedges are being grown extensively in the county with good success. Coal is found in all parts of the county of a superior quality; it is being dug in several places, and one coal mine has been opened and worked for the last two years with satisfactory results, the number of operatives varying from 25 to 100; this mine furnishing a large proportion of the coal used at Fort Scott and Kansas City. Lead has also been found in limited quantities. The manufacturing interests of the county have been almost entirely neglected, yet a move is now being made to establish a woolen-factory and also an oil-mill. There are 7 fine flouring-mills and 10 saw-mills in operation, all doing a good business. The census of 1870 gives 71,214 acres of improved land; 55,924 acres of woodland, and 94,009 acres of other unimproved land. Improved farms are selling for from $15 to $30 per acre, owing to location and improvement; wild land is worth from $5 to $12 per acre. The prices of land have declined during the last few years. Of the 4,247 inhabitants (census 1870,) a majority are employed in agriculture. The leading agricultural productions are wheat, corn and oats; the exports are confined almost entirely to wheat; the corn and oats are fed to stock at home. The crops of 1874 are considerably below the usual average yield, on account of severe drouth. Tobacco is cultivated for market in limited quantities, and cotton is not cultivated. Other cereals and fruits are grown successfully, but in limited quantities. Prairie grass is alone used for pasturage. Blue grass, clover and timothy are also grown with good success. The county being well adapted to the raising of cattle, much attention is paid to this branch of agriculture, and a great number of neat cattle and hogs are marketed annually. Poland-China and Berkshire hogs, as well as some blooded cattle, have been introduced. Sheep-raising has in many cases not been a success, but with attention and warm sheds to protect them through the winter and early spring, sheep-husbandry can certainly be made very profitable. A stock law is not wanted by more than one farmer in twenty. Rail, plank and picket fences are mostly in use, and there being an abundance of timber for fencing purposes, fences are cheaply built. Vernon county is one of the finest fruit-growing counties in the State, and the farmers have turned their attention to it and their hopes have been realized by fine crops of apples, pears, peaches, etc., of excellent quality. Grape-growing has not yet become a business, yet a majority of farmers cultivate a few vines for family use. The M. K. & T. R. R., passes through the county, affording the necessary facilities of transportation to market. A considerable number of emigrants from Illinois, Ohio and Kentucky, have settled in this county since the war, and more are wanted.

WARREN COUNTY.

The county is bounded on the south by the Missouri river, and is situated in the eastern central part of the State. It was organized January 5, 1833. The county is situated on the dividing ridge which separates the waters flowing into the Missouri from those flowing into the Mississippi. About three-fourths of its surface is on the southern decline, and one-fourth on the northern. The southern part of the county is timberland, and the northern portion is principally prairie. There are several classes of soil, such as the black loam, black sandy soil, and red or clay soil, and all are productive, the black soil exceedingly so. The deep alluvial soil of the Missouri bottom is famed for its fertility, often producing 80 bushels of corn per acre. The bluff lands bordering these bottom lands are also very productive and best adapted to wheat and fruit-raising. The county has an abundance of excellent timber of all varieties growing in this latitude, such as hickory, oaks, cottonwood, elm, beach, mulberry, hackberry, walnut, etc. The county is well watered by numerous creeks, and springs of water, clear as crystal, abound, affording all the necessary water for domestic use and stock. The mineral resources of the county have not been developed as yet. Lead, iron and coal are found, but not mined. Superior brick clay, fine limestone and excellent marble is also found, and the latter is quarried. The county had, in 1870, 70,523 acres of improved land, and 103,878 acres of unimproved land. The prices of land vary considerably, according to location, quality and improvements, but are quite low. Of the 9,678 inhabitants, the majority are farmers. The principal crops are corn, oats, tobacco, barley, rye, flax, broomcorn, sorghum, etc. Potatoes and the various kinds of vegetables succeed well. The principal exports are hogs, wheat and oats. The crops of 1874, with the exception of wheat, are below the average yield, caused by the continued drouth and the Chinch Bug. Tobacco is grown with success, and the crop of 1874, although not large, is of good medium grade. Pastures of cultivated grasses are but little used. Blue grass does remarkably well, growing spontaneously. A stock law is not wanted by many of the citizens. The principal fencing is of rails, and there is plenty of timber for that purpose. Osage orange hedges are grown and do well, except in very dry summers while young. Orchards and vinyeards succeed well, and much more attention is paid to fruit-culture than formerly, and many orchards are being planted. The county cannot boast of any other manufacturing establishments than 8 or 9 grist-mills, about the same number of saw-mills, one creamery or cheese factory, and two manufactories of cabinet wares. The principal market for Warren county is St. Louis. It is reached by the St. L., K. C. & N. R. R., passing 18 miles through the county from east to west, and by the Missouri river. Some of the surplus products are also shipped by the P. R. R., running south of the Missouri river. Comparatively only a small influx of immigration has come to this county, mostly from Europe.

WASHINGTON COUNTY.

Washington county is situated in the eastern part of the State, and was organized from a portion of the Ste. Genevieve district, August 21, 1813. The general surface of the county is broken—in some parts quite hilly and covered with pine, principally in the northwestern part. The soil is very productive, and the greatest part of the county is susceptible of cultivation. Most of the uplands and hillsides are extremely well adapted to horticulture, and to the cultivation of the grape, which grows wild almost everywhere, and invariably produces an abundance of fine fruit. Timber is still very abundant, and will, with proper care, be adequate to all future demands. Considerable lumber is made and shipped to market. The county is well watered by numerous streams and springs, furnishing all the necessary water for farming use, and also affording some excellent mill-sites. The water in all these streams is clear, being fed by cool, never-failing springs. The climate is healthy and mild. This county is one of the richest in the State in regard to its minerals, and some of its mines were opened as early as 1720. Lead, iron, copper and zinc are the leading minerals found. Lead ore is very abundant, and is mined to a great extent. It is smelted in 12 lead furnaces, and its mining and smelting employs a very great number of operatives. Specular and hematite iron ore are found in extensive beds. Zinc ore, formerly considered worthless, is found in boulders and ledges, and also below the surface, and in 1868 a zinc furnace was erected, which has now been removed to Carondelet, and the manufacture has attained large dimensions. "Tiff," or sulphate of baryta, is also extensively mined. Fine building stone and an excellent quality of stone for mill and grindstones are also found. The manufacturing establishments consist of the above mentioned lead furnaces; iron and zinc works; 10 grist-mills; some 15 saw-mills; some tanneries and some factories on a small scale. The county had, in 1870, 38,650 acres of improved land; 431 acres of woodland, besides 111,795 acres of other unimproved land. The prices of both improved and unimproved farm land varies considerably according to location, quality of soil and timber, kind of improvement, etc., but are quite low at present. The leading occupation of the 11,719 inhabitants (census 1870) is mining and agriculture. The mining interests have, to some extent, retarded all others for many years, but an industrious agricultural population has gradually settled on the productive bottoms and uplands. The leading agricultural staples are, corn, wheat, oats, tobacco and fruits, principally the grape. Tame grasses, clover, etc., are cultivated to some extent. The county offers great inducements to stock-raising, and a great number of improved breeds of all kinds of animals have been successfully introduced. The hilly portions of the county are excellent for the cultivation of fruit of all kinds adapted to this latitude, including the grape, and numerous orchards and vineyards are found everywhere, and rarely fail to produce a large yield. The leading market is St. Louis, though much of the surplus produce and stock is used in the mining districts. The St. L., I. M. & T. R. R. has 22 miles of track in this county, and furnishes the means for transportation. Potosi, the county seat, is connected with this railroad by a branch road. A considerable influx of immigration found its way to this county, both miners and farmers, and it is rapidly filling up.

WAYNE COUNTY.

This county is situated in the southeastern part of the State, and was organized December 11, 1818. The general surface of it is hilly, without prairies. The Ozark range of mountains runs through the northern and middle portions of the county. These mountains are covered with the finest quality of yellow pine, which is rapidly converted into lumber in the vicinity of the railroad. Many of these mountains are not in anywise adapted for cultivation. The rich bottom lands on the numerous rivers and creeks, are very rich and fertile, producing large crops of corn, etc. The St. Francois river runs through the central and eastern portions of the county, while the Black river meanders through the western part. These, with their numerous tributaries, and fine springs on almost every farm, furnish all the needed water, which also can very readily be obtained by digging at a depth of from 15 to 30 feet. Timber is abundant for all practical purposes, and for many years to come. Minerals are but slightly developed, but enough is known to show that the wealth of the county, in this respect, is immense. The iron ore, mostly blue specular, the different hematites, etc., have been obtained in some banks, and their quality is pronounced equal to any of the same kind found elsewhere in the State. Lead and other minerals have also beeen found in different parts of the county, but no coal. The manufacturing interest of Wayne county is still in its infancy, though the completion of the railroad has given an impetus for the better. Sixteen steam saw-mills convert the yellow pine into excellent lumber; a very fine flouring and planing-mill, with the latest improved machinery for the manufacture of flour, is situated at Piedmont; tobacco factory and one cotton-gin, with several small blacksmith shops, where plows and other agricultural implements are made, will close this enumeration of manufacturing establishments. The county had, in 1870, 27,489 acres of improved land; 97,766 acres of woodland, besides ——— acres of other unimproved land. Some government land of a poor quality, but valuable for the timber, and some railroad land of similar description, can be bought cheap. The price of land, varying according to location, quality and improvement, is quite low. The leading occupation of the 6,068 inhabitants (census 1870) is agriculture. The principal agricultural staples are wheat, corn and oats. The latter two are chiefly fed to stock, which is marketed, and forming with wheat the articles for export. The county is well adapted to stock-raising, there being an abundance of wild pastures, covered with a luxuriant growth of wild grasses. The soil and climate are also very well adapted to the growth of the delicious grape, and fruits of all kinds. St. Louis is the principal market, and is reached by the St. L. & I. M. R. R., traversing the county, in the western part, from north to south.

WEBSTER COUNTY.

This county was organized from parts of Greene and Wright, March 3, 1855; it is situated in the southwestern part of Missouri. The general surface of this county is uneven and rather broken. The Ozark Mountains extending through the center of it. It is mostly overgrown with timber, principally the several varieties of oaks, hickory, walnut, hackberry and other kinds, enough to supply all the demands for fencing, building and railroad purposes. The soil is excellent in the creek bottoms and prairies, very fertile and well adapted to farming purposes; on the uplands, which comprise a large portion of the area, it is medium, but very well adapted to fruit-growing and viticulture. There are plenty of rivers, creeks and springs in the county to supply water for all purposes; the tributaries of the White river run in a southwestern, and those of the Gasconade river in a northeastern direction from the Ozark hills. Of minerals there is chiefly lead, iron, copper and sulphur, the former in great abundance and mined in several places. Most of the veins are not yet developed. The climate of the county is mild and salubrious. The manufacturing resources are yet few, comprising 8 flouring-mills, five saw-mills, and some wagon-shops, and one furniture manufactory. The county had, in 1870, 38,686 acres of improved land; 93,541 acres of woodland, and 13,558 acres of other unimproved land. About 39,000 acres of land are owned by the government, and 80,000 by the A. & P. R. R., which is for sale on long time and by installments. The prices of improved land vary considerably, ranging from $10 to $50 per acre; unimproved lands are sold at from $1.25 to $15 per acre; timberland, at $2.50 to $10 per acre. The leading occupation of the 10,434 inhabitants (1870), is agriculture. The principal productions are corn, wheat, oats and hay, producing good average yields. The exports are wheat, tobacco, beef cattle, hogs, sheep, mules, horses, hides, fruit and lead. The uplands are particularly well adapted to the culture of tobacco, and large quantities of very fair quality are grown for market; it is the main staple of the county, yielding from 1000 to 1,200 pounds per acre. The raising of stock of all kinds is quite profitable on account of the extended wild pastures and mild winters, and much more attention is being paid of late years to the introduction of better breeds. Sheep are healthy, and would be very profitable to raise in larger numbers than is done at present. Timothy yields from one to two tons per acre, and is raised to some extent. A stock law is not yet wanted by a majority of the farmers. Rail fences are mostly in use, costing from 25 to 30 cents per pannel. Hedges, principally the Osage orange, have been tried with success, but are only little cultivated on account of the abundant supply of timber for fencing purposes. All fruits common to southern Missouri succeed well, and are cultivated to a greater extent than formerly, and small ororchards are rapidly increasing in numbers. The facilities for market are very good, the A. & P. R. R. running through the county northeast to southwest—about 25 miles—but the charges on freight are claimed to be very high. Tennessee, Pennsylvania, Illinois, Ohio, Iowa and other States have contributed the greatest numbers of immigrants to this county, and the influx has been quite large since the war.

WORTH COUNTY.

Worth county is situated on the Iowa State line, in the northwestern part of Missouri; it was organized February 8, 1861. Its surface is gently undulating; about two-thirds prairie and the rest timber. The soil is a black, sandy loam, varying in depth from one to five feet, and very fertile. Along the numerous water-courses, of which the principal ones are the East, Middle and West Fork of Grand and Platte rivers, a heavy growth of timber of good quality is found, being abundant for all purposes; in fact the growing exceeds the consumption, owing to the greater protection from prairie fires than formerly. White, burr and other oaks, walnut, hickory, hackberry, elm, maple, cottonwood, etc., are the principal varieties found. The three rivers mentioned, with their numerous smaller affluents, drain every part of the county and furnish all the necessary water for use on farms and for stock. The climate is mild and salubrious. The minerals have not yet been developed to any extent; but the whole county is underlaid with coal and excellent limestone for building, and lime-making abounds. Five flouring-mills, several saw-mills, one pottery, two carding machines, several furniture manufactories and brick-yards are located in the county. The census of 1870 gives 45,125 acres of improved land; 24,122 acres of woodland, besides 41,613 acres of other unimproved land. The price of land is, on an average, for improved farms, about $18, and of unimproved land about $5 per acre. Agriculture is the leading occupation of the 5,004 inhabitants, (census 1870,) and the leading agricultural staples are wheat, corn, oats and rye. They are very profitably raised by the majority of farmers, and they do not attempt to cultivate any other crops. Tobacco, flax and hemp, which will form a part of the annual exports in the future, are also grown with the most satisfactory results. Much attention is also paid to profitable stock-raising, and horses, cattle and hogs are quite extensively fed for market. Considerable quantities of poultry are sent to the California and Oregon markets. Fruits of all kinds are raised easily, and in great abundance, and many orchards are planted annually, with great promise of profitable returns. At present the county has no railroad within its border; the St. J. & C. B. R. R. runs through Nodaway county west of Worth county. The county received since the war quite a fair influx of immigration, mostly of an industrious class. As can be seen by the table, the educational interests receive attention commensurate with their importance.

WRIGHT COUNTY.

This county is situated in the southern part of the State; was organized January 29, 1841. The greater portion of it lies on the northern slope of the range of mountains known as the Ozark, a region noted for its climate and healthful tendencies. The ascent of these mountains is so gradual as to be almost imperceptible. The surface of the county is diversified by hill and dale, ridge and valley, prairie and bottom land. The largest body of level land is situated on the summit of the mountains in the southeastern part of the county. The bottoms are very rich, producing abundant crops of all kinds of grains and tame grasses. The valley lands are the next best class of land, preferred in fact by many farmers, being more easily cultivated and subject to overflow by spring freshets. The upland is, in some parts, also very fertile, and well adapted to the growth of tobacco. There is an abundance of water for stock and water-power in every part of the county, and at all seasons of the year. The Gasconade river is the principal stream running through the county. Timber is still abundant for all purposes, and of good quality. Lead is found in many parts of the county, but little has been done, as yet, to develop it, and only a few shafts have been sunk near the Whetstone creeks. Coal and iron have been found in several localities, and it is believed that they occur in paying quantities, and are only waiting for capital to develop them. There are few manufacturing establishments in this county, comprising two steam grist and saw-mills; several small water-mills, and some small shops for making wagons and plows. With about the best water-power in the State, this county offers an excellent location for a merchant-mill and a woolen-mill, which are both much needed, and which would be liberally patronized. The health and climate of the county is good, the lattter somewhat variable in winter, but not more so than in other neighboring counties.

The county had, in 1870, 22,186 acres of improved land; 96,557 acres of woodland, besides 22,923 acres of other unimproved land. The average price of improved deeded land is probably from $7 to $11 per acre; of unimproved land, from the government price $1.25 to $2.50 per acre. Considerable land is subject to entry under the homestead and pre-emption laws, that will make desirable homes. These lands are being taken up very fast, and, in consequence, improved lands are cheap and only slowly increasing in value. Of the 5,684 inhabitants, census 1870, the majority are farming. The principal agricultural products are corn, wheat, oats and hay. Wheat is exported; corn and oats are fed to stock and marketed as such. The average yield of 1874 was considerably below the usual one on account of the long continued drouth and the Chinch Bug. Tobacco is raised to a considerable extent, and from appearances it will be the leading crop of 1875. Cotton grows well and has a good fiber, but is raised principally for home use. Rye is getting to be a general crop, mostly as a winter pasture. Sweet potatoes seem to have found here their home, growing to very large dimensions. Having fine and large ranges on United States lands, tame grasses are little or not at all cultivated. All the different kinds of stock do well. A few heads of improved short-horn cattle have been introduced, of rather doubtful purity. Sheep do very well on the wild grass, and with proper care sheep-husbandry could be made very profitable. A stock law is not wanted, as fencing can be done cheaply with rails. No hedges have been planted in the county. The fruit is as fine as in other counties. Apples, pears, peaches, plums, and the small fruits, all succeed well. Some interest is taken in the culture of the grape-vine, but little wine is made as yet. Wild grapes bear profusely, and are much used in making preserves. The A. & P. R. R. passes about 25 miles from the county seat, and furnishes the only means of transportation of the surplus grain, cattle and hogs to the market, which is St. Louis. Immigration has been steadily coming to Wright county since the war, and the population has more than doubled since that time.

TABLE—Showing Population, Enumeration, Enrollment, Districts, No. of School Houses, No. of School Houses Built During the Year, Total Valuation, No. of Public and Private Schools, and No. of Teachers.

COUNTIES.	Population	ENUMERATION.			ENROLLED IN.			No. of districts	No. of school houses.	Built during the year 1874	Total valuation of school houses and furniture	NO. OF PUBLIC SCHOOLS.			Private Schools	TEACHERS.		
		White	Colored	Total	Pub. schools	Priv't schools	Total					Primary	High	Colored		Male	Female	Total
Adair	11,448	4,909	49	4,958	8,491	55	3,546	74	73	1	$29,700	98	1	1	2	54	44	98
Andrew	15,187	5,937	152	6,089	4,591	35	4,626	80	80	1	75,167	85	1	2	1	80	44	124
Atchison	8,440	3,847	15	3,862	2,857	70	2,927	62	59	8	57,347	59	1	......	2	65	31	96
Audrain	12,307	4,605	425	5,030	3,336	292	3,628	72	68	8	37,144	77	2	2	11	57	44	101
Barry	10,878	4,718	......	4,718	8,092	193	3,285	80	67	6	10,468	62	......	......	6	57	13	70
Barton	5,087	2,762	......	2,762	1,638	......	1,638	49	45	8	31,618	49	......	......	......	35	19	54
Bates	15,960	6,672	55	6,727	5,406	82	5,488	122	118	9	91,458	129	1	1	4	95	50	145
Benton	11,322	4,484	153	4,587	3,089	52	8,101	75	84	......	82,144	80	......	8	5	72	26	98
Bollinger	8,162	8,301	9	8,810	2,099	......	2,099	60	46	5	14,035	46	......	......	......	32	8	40
Boone	20,765	7,778	1,243	9,021	4,896	955	5,851	115	105	10	60,910	103	1	11	23	90	46	136
Buchanan	35,109	11,611	729	12,840	7,022	......	7,022	69	76	......	159,381	89	1	4	......	96	47	143
Butler	4,298	1,499	10	1,509	308	22	330	19	11	1	995	10	......	......	2	9	8	12
Caldwell	11,890	4,336	80	4,416	3,507	35	3,542	63	65	8	69,185	63	8	2	2	62	44	106
Callaway	19,202	6,591	1,088	7,677	4,380	473	4,853	107	110	21	87,842	110	......	10	23	95	40	135
Camden	6,108	3,185	72	3,257	1,818	102	1,920	52	45	4	5,170	48	......	1	4	38	9	47
Cape Girardeau	17,558	6,885	785	7,170	8,555	861	4,416	80	71	4	67,996	63	1	5	16	65	14	79
Carroll	17,446	7,423	453	7,876	4,010	75	4,085	97	92	6	80,010	98	1	4	2	69	49	118
Carter	1,455	487	......	487	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Cass	19,296	7,242	182	7,424	4,695	118	4,813	117	102	4	65,375	105	......	......	4	93	37	130
Cedar	9,474	4,228	41	4,269	2,972	27	2,999	62	57	5	19,508	80	1	1	6	79	11	90
Chariton	19,186	7,824	1,122	8,446	5,326	77	5,403	107	102	11	68,881	99	1	9	8	91	27	118
Christian	6,707	2,784	102	2,886	1,967	28	1,095	38	85	4	4,265	85	......	1	1	28	14	42
Clark	13,667	6.408	116	6,524	4,129	804	4,438	91	90	11	64,592	95	5	2	16	65	44	109
Clay	15,564	5,393	529	5,922	3,738	406	4,144	64	66	9	59,870	65	......	5	11	62	17	79
Clinton	14,068	4,866	299	5,165	3,125	205	3,330	59	58	5	56,785	65	1	8	5	64	28	92

Cole	20,692	6,536	1,181	7,717	4,089	12	4,101	53	49	2	$62,292	48	......	2	9	41	18	54
Cooper	7,982	3,474	71	3,544	1,856	268	2,124	81	87	1	105,752	80	......	18	9	85	86	121
Crawford	10,292	5,161	630	5,791	2,052	69	2,121	76	67	8	12,800	60	......	......	6	46	16	62
Dade	8,683	4,055	88	4,143	2,941	57	2,998	71	62	3	22,073	69	1	3	2	47	21	68
Dallass	8,883	3,718	20	3,738	2,509	....	2,509	63	59	6	8,204	61	......	......	3	48	13	61
Daviess	14.410	6,195	82	6,277	4,806	80	4,886	88	88	1	34,100	88	......	......	......	88	41	129
DeKalb	19,858	4,183	55	4,238	2,379	....	2,379	64	59	17	89,405	65	......	1	5	64	36	100
Dent	6,357	2,866	18	2,884	1,857	238	2,095	58	52	3	17,252	55	1	......	14	41	21	62
Douglas	8,915	1,976	3	1,979	292	....	292	14	15	5	1,275	14	......	......	......	7	2	9
Dunklin	5,982	1,586	17	1,603	130	70	200	16	16	2	2,070	11	1	......	2	4	5	9
Franklin	30,098	8,559	634	9,193	3,080	....	3,080	80	76	5	51,184	75	......	6	7	72	21	93
Gasconade	10,093	4,118	11	4,129	2,059	69	2,128	52	54	......	34,213	52	......	......	6	53	2	55
Gentry	11,607	5,172	25	5,197	3,908	50	3,958	76	75	4	46,035	76	......	......	2	74	80	104
Greene	21,549	7,969	835	8,804	6,032	82	6,114	101	96	8	88,081	100	......	11	12	80	88	18
Grundy	10,567	4,765	40	4,805	3,822	20	3,842	78	76	1	53,276	109	1	1	2	63	48	111
Harrison	14,685	6,673	7	6,680	5,670	168	5,838	124	115	15	57,450	118	1	......	5	108	62	165
Henry	17,401	6,991	295	7,286	4,260	15	4,275	104	100	8	45,220	104	......	......	......	95	43	138
Hickory	6,452	2,666	20	2,686	1,671	96	1,767	40	88	1	7,234	87	......	......	8	37	7	44
Holt	11,652	4,660	72	4,732	2,874	25	2,899	65	59	7	47,640	60	1	1	13	59	20	79
Howard	17,238	4,445	1,004	4,449														
Howell	4,218	2,401	11	2,412	744	201	945	55	23	4	2,075	27	1	......	6	86	7	48
Iron	6,278	2,849	88	2,937	957	23	980	25	25	1	7,910	23	2	......	6	18	12	80
Jackson	55,041	13,347	996	14,343	8,840	70	8,910	100	97	6	253,378	97	......	2	7	93	58	151
Jasper	14,928	8,324	84	8,408	5,085	12	5,097	109	90	18	90,005	102	......	1	1	88	45	123
Jefferson	15,880	5,704	229	5,933	3,350	178	3,528	82	78	12	37,849	79	......	8	14	78	17	95
Johnson	24,648	9,090	685	9,775	7,581	16	7,597	124	112	5	90,045	117	......	7	1	91	65	156
Knox	10,974	4,645	73	4,718	3,462	168	3,630	72	72	7	36,087	72	1	2	3	68	48	111
Laclede	9,380	8,817	166	8,983	1,729	242	1,971	67	50	4	38,148	52	......	......	14	83	24	57
Lafayette	22,623	7,454	1,322	8,776	4,886	799	5,685	91	95	4	65,185	101	2	8	20	84	45	129
Lawrence	18,067	5,223	104	5,327	3,527	349	3,876	83	69	5	47,637	74	1	2	9	63	15	78
Lewis	15,114	5,504	430	5,934	4,286	....	4,286	75	62	......	56,890	75	1	1	......	70	28	98
Lincoln	15,960	5,538	647	6,185	3,807	179	3,986	79	82	6	40,158	79	1	8	11	71	25	96
Linn	15,900	6,470	321	6,791	5,212	....	5,212	105	104	12	85,190	114	5	6	......	97	67	164
Livingston	16,730	6,417	428	6,845	5,128	....	5,128	109	93	2	72,720	102	8	4	......	85	50	185
McDonald	5,226	2,497	7	2,504														
Macon	28,230	8,954	536	9,490	5,138	241	5,874	120	118	......	77,398	124	1	6	3	100	49	149
Madison	5,849	2,766	55	2,821	1,164	246	1,410	40	32	2	14,005	29	1	1	7	28	9	87
Maries	5,916	2,592	6	2,598	716	153	869	51	89	4	9,059	82	......	......	7	33	3	86
Marion	23,780	7,262	1,273	8,535	4,474	863	5,337	56	62	6	91,975	57	1	8	19	59	42	101
Mercer	11,557	5,222	31	5,253	3,818	39	3,857	78	67	4	33,160	69	1	......	4	61	28	89
Miller	6,616	3,523	95	3,618	2,586	9	2,595	70	65	6	19,890	70	1	2	1	54	19	73
Mississippi	4,982	2,061	808	2,869	1,026	....	1,026	28	24	......	4,258	25	1	4	......	23	5	28

TABLE—CONTINUED.

COUNTIES.	Population..............	ENUMERATION.			ENROLLED IN.			No. of districts.........	No. of school houses.	Built during the year 1874..................	Total valuation of school houses and furniture...............	NO. OF PUBLIC SCHOOLS.			Private schools.........	TEACHERS.		
		White	Colored........	Total...........	Pub. schools.	Priv't schools	Total...........					Primary	High............	Colored........		Male	Female.........	Total......
Moniteau..................	11,875	4,996	310	5,306	4,117	103	4,220	78	79	17	$68,165	78	2	5	7	68	30	98
Monroe....................	17,149	5,890	754	6,644	4,562	194	4,756	93	92	10	45,565	91	1	10	8	73	45	118
Montgomery	10,403	4,489	559	5,048	3,774	290	4,064	75	78	1	40,597	79	......	5	10	53	41	94
Morgan....................	8,434	3,475	168	3,648	1,474	25	1,499	......	82	......	8,262	43	......	8	5	32	9	41
New Madrid..............	6,357	2,047	395	2,442	888	126	1,014	26	23	1	4,195	21	......	8	8	19	7	26
Newton.....................	12,821	5,894	219	6,113	4,063	322	4,385	79	72	6	29,104	78	2	3	12	65	27	92
Nodaway..................	14,751	6,451	....	6,451	4,581	....	4,581	182	129	11	84,864	180	1	1	1	102	72	174
Oregon.....................	3,287	1,808	2	1,810	634	206	840	38	16	1	910	18	......	......	2	20	2	22
Osage.......................	10,793	4,097	99	4,196	2,726	60	2,786	67	57	2	15,279	65	1	......	5	42	24	66
Ozark.......................	8,363	1,889	....	1,889	791	42	833	34	30	......	2,665	21	1	......	3	24	3	27
Pemiscot...................	2,059	1,282	38	1,320	519	40	559	14	18	1	2,165	13	......	......	......	8	7	15
Perry........................	9,878	3,861	180	4,041	1,709	713	2,422	55	49	3	20,531	47	......	2	19	43	8	51
Pettis.......................	18,706	6,738	738	7,476	4,477	67	4,544	99	87	11	106,095	97	5	9	9	69	40	109
Phelps.....................	10,506	4,474	97	4,571	2,660	316	2,976	51	54	6	46,372	48	2	3	2	42	30	72
Pike..........................	23,076	7,745	1,525	9,270	6,177	575	6,752	88	93	12	92,133	107	2	13	8	80	45	125
Platte.......................	17,353	5,738	262	6,000	3,520	274	3,794	69	67	1	66,565	69	......	2	6	65	27	92
Polk.........................	12,455	4,307	....	4,307	4,317	111	4,428	86	85	8	28,525	84	......	.....	13	80	19	99
Pulaski....................	4,714	2,327	10	2,337	1,157	75	1,232	49	31	5	7,026	35	1	......	2	29	9	88
Putnam....................	11,217	5,063	4	5,067	3,070	....	3,070	74	71	4	15,559	90	......	......	......	69	34	108
Ralls........................	10,510	3,871	414	4,285	2,696	50	2,746	58	59	3	15,552	59	......	2	1	46	32	78
Randolph.................	15,908	5,781	699	6,484	3,675	67	3,742	71	65	7	37,295	65	......	......	9	61	31	92
Ray..........................	18,700	6,877	652	7,529	5,241	75	5,316	93	101	5	88,828	105	1	6	2	90	36	126
Reynolds..................	3,756	1,526	....	1,526	672	....	672	29	20	1	4,524	19	.....	......	4	19	3	22
Ripley......................	3,175	1,260	....	1,260	752	12	764	26	28	......	2,365	15	......	......	2	14	2	16
St. Charles...............	21,304	7,089	662	7,751	2,981	1,151	4,132	66	63	6	65,143	61	......	8	20	47	26	78
St. Clair....................	6,742	5,089	205	5,294	3,422	....	3,422	87	81	6	25,179	96	......	......	......	73	38	111

St. Francois	9,742	3,578	156	3,749	2,118	262	2,375	51	42	......	19,900	48	......	2	18	36	17	58
Ste. Genevieve	8,887	3,430	166	3,596	2,012	201	2,213	47	48	5	13,485	49	......	2	6	37	15	52
St. Louis	351,189	133,980	6,646	140,626	87,596	446	88,042	188	155	1	143,737	140	5	17	14	70	548	613
Saline	21,672	7,677	1,276	8,953	4,130	441	4,571	109	100	4	86,155	111	2	13	18	84	28	112
Schuyler	8,820	4,097	6	4,103	2,848	....	2,848	61	59	10	27,385	76	3	......	......	42	34	76
Scotland	10,670	4,706	65	4,771	3,807	160	3,967	71	72	1	35,415	75	1	1	5	62	44	106
Scott	7,317	2,587	168	2,755	1,186	40	1,226	30	29	4	5,875	20	1	1	2	21	5	26
Shannon	2,339	1,130	....	1,130	415	69	484	34	23	6	1,380	18	......	......	4	15	3	18
Shelby	10,119	4,078	285	4,308	3,204	205	3,409	67	68	5	37,183	72	2	4	5	60	47	107
Stoddard	8,535	4,009	17	4,026	2,290	....	2,290	50	43	......	5,582	47	......	......	......	41	5	46
Stone	8,253	1,303	8	1,311	260	....	260	26	10	2	1,005	7	......	......	2	7	......	7
Sullivan	11,907	5,158	1	5,159	4,266	205	4,471	91	86	......	29,833	91	......	......	4	80	33	113
Taney	4,407	2,003	1	2,004	495	171	666	27	20	3	1,485	15	......	......	7	16	4	20
Texas	9,618	4,412	....	4,412	3,391	103	3,494	90	81	9	13,060	81	8	......	5	74	14	88
Vernon	11,247	5,229	44	5,273	2,731	9	2,740	78	73	7	64,510	88	......	......	......	71	81	102
Warren	9,673	3,585	269	3,854	2,032	255	2,287	51	52	2	18,745	49	......	8	8	42	13	55
Washington	11,719	4,049	321	4,370	2,088	219	2,307	59	58	4	22,886	54	......	2	9	43	20	63
Wayne	6,068	2,628	9	2,632	1,747	93	1,840	53	44	9	10,649	40	......	......	6	36	5	41
Webster	10,434	4,131	109	4,240	3,112	93	3,205	60	58	6	71,181	59	1	1	11	42	24	66
Worth	5,004	2,515	3	2,518	1,569	145	1,714	51	44	5	21,975	53	......	......	6	33	19	52
Wright	5,684	3,128	39	3,167	2,275	....	2,275	63	61	3	7,302	52	......	......	......	48	9	57

THE LIVE STOCK INTERESTS OF MISSOURI.

There is no State in the Union which so happily unites all the most desirable requisites for successful stock-raising as Missouri. Occupying a middle place between her Northern and Southern sisters, she suffers neither from the long continued and excessive heat of the one, nor from the fierce frosts and interminable winters of the other. Within her boundaries there are something over 67,000 square miles of country, rarely blessed with hill and valley, and plain of unequalled fertility; watered by the innumerable tributaries of the Missouri and the Mississippi, and suited to the successful cultivation of the products which supply the daily wants of man and beast. In nearly every section of the State, blue grass, the husbandman's staunchest friend, grows spontaneously and luxuriantly. Its solid sod affords pasture for horses and cattle for nine months in the year, and even on the bare hills of the mining counties, fine range for sheep in sufficienty quantity to pasture flocks of California size is found. While such is the case, it is none the less true that the farmers of Missouri have overlooked the great natural advantages which their section possesses as a breeding and feeding center over that of their neighbors. Heartily allied to the crop system, by which the wealth of their farms is transferred to a distance, to increase the fertility of less favored sections, they have robbed the soil for successive years, and gradually surrendered their independence to the public carriers, upon whom they depend absolutely for a market. True, there are exceptions to the rule. Scattered here and there over the State, are found enterprising and far-seeing breeders of fine stock, who have persevered in the laudable endeavor to open the eyes of the masses to the great advantages of stock-feeding and breeding, over the continuous system of wheat and corn-cropping. Their success has, however, been nothing remarkable, and still we hear the refrain of complaint among those who are suffering from lack of transportation for their corn and wheat in consequence of bad roads, indifference of railway companies, or distance from market. The more remote from business centers, the more stringent becomes the necessity for a change in the practice of farmers in the management of their interests. At a distance of ten or fifteen miles from a railroad, and many miles further from a good market, a well-turned bullock can carry a bushel of corn to market cheaper than anything else. There are rules, and rules laid down, to guide the farmer in the sale of his grain; but it is well to bear in mind that no amount of calculation can correctly guage the gouging capacity of railroad officials and middlemen generally, and that the only safeguard against being fleeced, is to simplify the transaction as much as possible. We have much to learn in this respect from the example of farmers in Kentucky, Vrginia, and portions of Tennessee, where it is the practice to make stock-grazing an important part of the general farming. In Loudon and Faquier counties, Virginia, lying contiguous to Washington, and in easy access to Baltimore and Philadelphia, it has been the custom since time immemorial, to retain a large portion of the farm in blue grass, (which grows to perfection in that section,) for the purpose of grazing cattle for these markets. The cattle are bought by agents in East Tennessee, Kentucky or Ohio, and driven in in early spring, kept during summer season and sold in the fall, usually at very great profit. I have heard it said that 100 per cent. was not a remarkable return upon investments thus made in cattle, and that the surplus from cattle feeding was often the only thing to bring out an annual balance on the credit side of the farm.

There is no intention on the part of the writer to instruct the farmers of Missouri in the management of their own affairs, nor would the limits of this article permit an extended or detailed discussion of the live stock question in its bearings upon every locality.

The idea is merely to lay a few facts before the intelligent farmer, to act as aids in the management of his peculiar interests, by which he may be enabled to compare his own experience with that of others, and work out his agricultural salvation by the shortest and easiest method. We have our partialities and prejudices, and while there are some of us, possibly, who lean a little too much to the side of book farming and fancy notions, there are others, we all know, who wander very much farther in the other direction, to *their* detriment and that of the community in which they live.

A farmer having once determined to engage in stock-raising, or feeding, has another important step to take before he is armed with the guerdon of success. He must disabuse his mind of the "old farmers' idea, that one horse, hog or cow is as good as another—it is all in the corn crib." If any one thing, more than another, has had a chilling effect upon the live stock interests of Missouri, it has been the herculean attempt of her feeders to swell their Texas steers and rail-splitting porkers into competition with the sleek Short-horn bullocks and round Berkshire swine of Kentucky and Illinois. It requires a great deal of corn to do it, and besides it is never done. Any one who has attended the stock-yards of late years, will have observed the marked improvement which has taken place in the appearance and character of the daily offerings. Corn has not produced these results, and, it is a fact not to be denied, that the weight of our cattle, sheep and hogs has been increased largely, and their maturity much advanced by the introduction of improved males for crossing upon the native stock. There is doubtless great difference of opinion among the breeders of improved animals as to which especial kind is exactly suited to each separate locality; but a little intelligent inquiry will assuredly enable the thinking farmer to decide that question for himself; and he cannot but become convinced that almost anything would be an improvement upon the scrub stock now in his possession.

The objections urged against what has been widely termed "fancy stock," are: First—That they are too high-priced; Second—That they are too delicate and need too much care and attention; and third—That they are after all only an improvement upon the native, and that good feed and attentive breeding will accomplish again what has already been done. In answer to the first objection, it is only necessary to say, it is what an animal is worth to us, and not what he costs us, which should determine whether we have paid too much, or too little for him. If a Short-horn bull, costing $500, adds $500 per annum to the value of the stock upon the farm, no one questions the fact that, in comparison with the first cost, his annual return makes a very fair showing. Take a flock of scrub sheep, small of size, ill-shapen, and producing a very limited quantity of indifferent wool, each year. Introduce a number of high-bred, large, well proportioned rams, and mark the result, with each returning year. The bad points of the flock are superceded by the good ones of the rams, and soon the puny ewes, worth, say $2 per head, are replaced by broad-backed, short-legged, thick wooled sheep, which will readily retail in the nearest market at twice or three times as much as the original, while the very wool upon their backs will pay for their keep. These are no wild assertions, lacking the proof furnished by experience. So well agreed are intelligent farmers upon the necessity of introducing this improved blood among their herds and flocks, that the breeders of England are to-day unable to supply tho constantly increasing demand from Australia, the United States and other portions of the world. Let not Missouri stand in the back-ground in the race for excellence. The larger the number of breeders interested, the more apt they are to succed. It is not necessary to compete with the nabobs in the purchase of breeding animals. There is many a Short-horn to be purchased for a fair price, which will add as much to the value of a herd, as the greatest duke or duchess of them all. These fancies of fancy men for fancy animals at fancy prices, have done much to deter business farmers from entering the arena. There is no question that to undertake to follow the foolish example of these few, would be unbusiness-like, and sure to end in grief.

As to the second objection, we have only to look about us intelligently to find proof positive of its fallacy. Many of our farmers obtain their first insight into the mysteries of fine stock-breeding at our agricultural fairs. They observe the prize horses and cattle, blanketed and groomed, protected from the sun and sheltered from the cold, fed upon the richest provender, regardless of expense, and attended by numerous herdsmen and grooms. They look suspiciously upon the mammoth sheep and hogs; the first with the wool carefully combed, with barber-like neatness; the last named soaped and curried, and groaning under the weight of corn and slops they have consumed. They estimate the cost of all this "nonsense," and, in nine cases out of ten, arrive at the conclusion that the old ruts are the best, and that these new-fangled notions are not worthy of tho notice of *practical* men. The mistake is, that they select an inauspicious time and place to form their opinions. The fair grounds are not, as now conducted, by any means the scenes of *practical* exhibition. We know how often ginger and fat overcome excellence in the prize ring, and we are not astonished that many good farmers and first-class breeders have ceased to submit their stock to the exhibition test. The right place to examine improved stock is in the field, or the barn, and the right time is whenever you can make a fair comparison between their merits, and that of your own stock, both being submitted to the same general treatment. It is unnecessary to say that the objection suggested is with all truthfulness made and sustained against these pampered, show animals. They *are* delicate, they *do* need extra care and attention, and they *will* certainly run down unless they are nursed and groomed, and blanketed and fed on extra food. But from these facts, it does not follow that, had their early training been different, they would not have been as hardy and as capable of suffering the extremes of heat and cold, and hunger, as the veriest pine-knot among the native stock of the country. To those among the breeders of short-horn cattle, for instance, who have the independence to exhibit their animals in fair, healthy condition, without the superfluity of flesh, so usually considered a necessary adjunct, the general farmer owes much. He may learn upon inquiry that these fine, large, well-shapen cattle have received no more care than he has given to the miserable little brutes at home; that they were sustained through the season upon pasture, without additional food, and he can see for himself that it behooves him to change his stock, if he wishes to keep up with the times.

The plea of some farmers that it is corn which has produced the great improvement in superior breeds of live stock, and that good feeding and ordinary attention to the best crosses will accomplish all that may be obtained by the introduction of males of the already improved breeds, is doubtless a good one. Assuredly, if the average farmer has the time and intelligence to invest in the business, he may, during a lifetime, even add very much to the value of his native stock by pursuing a systematic line of feeding and breeding. He may be able, after a series of years of close attention to his business, to bequeath to those who come after him, a breed of animals of great merit, that will transmit their good qualities from parent to offspring.

But, granting that he does accomplish his end, it would seem that he has selected a long, tedious and round-about way to do so, for the simple reason that he had shut his eyes to the lights about him—refused to profit by the results accomplished by his forerunners in the breeding fraternity, and had deliberately gone over a long track to reach the point from which he might, with perfect ease, have started.

Making a breed and bringing it to perfection are two difficult and different things. The Collings, Ellman, Bates, Bakewell, Stevenson, and a host of other Englishmen, distinguished as careful breeders, have bequeathed a legacy of great value to posterity —for, to *them* are we indebted for almost everything of good which marks the improvement of our domestic animals. Patiently and earnestly, they pursued their investigations, marking results, and correcting evils—crossing and breeding-in with rare intelligence, coupling their animals to the best advantage—until a Short-horn cow, a Clydesdale horse, a Cotswold sheep, a Berkshire hog, is no more what he was a hundred years ago than St. Paul's in London is like the primitive huts of the original Britons. With the experience of such men before us, and the results of their experience so accessible, it would be an exhibition of a want of common sense at this day, to insist upon doing what we are compelled to acknowledge *they* have so ably accomplished for us. The proper method would be, to commence where they left off, and continue the process of improving until perfection is reached.

In estimating the advantages of stock-raising over the crop system, it should be borne in mind that the labor-bill of the farm is very materially reduced when the principal occupation of the hired men is to attend to the wants of animals, which, for many months of the year, will attend to themselves. The first cost of stock-farming is greater, but afterward a few hands will do all requisite work, and demand much lower wages than when employed to follow the plow, or perform the serious drudgery of farm labor.

The strong argument, however, in favor of the one system over the other is, that while crops of wheat, corn, oats, etc., annually drain from the soil, gradually but surely, its plant life, and destroy its fertility, the handling and feeding of stock will increase the productive power of the land from year to year, until after a length of time, during which the farm has paid its annual surplus, its fertility is increased, and it is actually worth more money, per acre, than it was before the process began. We have only to mark the condition of farming lands in the blue grass regions of Kentucky and Tennessee, to observe the beneficent results obtained by a judicious system of grazing. These much vaunted blue grass sections are equalled, and even surpassed, by many of our unappreciated farming districts; and yet we seem to have quietly yielded the palm to Kentucky, Tennessee, and even Illinois, as the great stock-producing centres of the country. Wherever pasture grass makes a stand at all in the State, blue grass is found growing spontaneously and luxuriantly. Its sod is as solid, its growth as certain, its nutritiousness as great, and its advantages as well recognized, as elsewhere. The theory so often urged by uninformed persons that Kentucky is indebted to her splendid blue grass pastures for her undoubted supremacy in breeding of fine stock, has no foundation in truth. Her people were wise enough, however, to foresee that it was not in the nature of the American people to satisfy themselves with a second place in the advancement and improvement of their live stock interests, and anticipating the growing demand for improved horses, cattle, sheep and swine, they launched boldly into the business, and secured the nation's custom because they were first in the field. It is always so. It requires some nerve to take the initiative in such matters, and the breeders of Kentucky had it. Who does not remember with what amazement the news was received that Alexander had bought first one animal, and then another, for *thousands* of dollars, when our appreciation of the same stock would not have amounted to as many hundreds! Who was the wiser? Certainly he who, having the means, increased his own fortune many fold, and proved a benefactor to the community in which he lived, and through it, to the country at large. It has been said that he who makes two blades of grass grow where but one grew before, is a benefactor of his kind. Assuredly he who has, by his munificent enterprise, added so many hundreds of thousands of dollars to the value of the live stock of the country, is even more entitled to the name. In alluding to Mr. Alexander's case, there is no intention to detract from the merits of others. Many have followed in his footsteps, to the great advantage of themselves and their neighbors, until at this day, it is no man's fault but his own if he fails to profit by the many opportunities offered, at private sale and auction, to secure good animals at reasonable prices.

Having thus, in a few words, enumerated some of the advantages which we think appertains to stock-raising, and having squarely asserted the opinion that our people have heretofore too much neglected this great source of wealth and prosperity, a short sketch of the origin, habits, appearance and characteristic qualities of the principal breeds of our most useful domestic animals will not be out of place. Many uninformed persons read the description of certain breeds of cows, for instance, and recognizing some peculiar want, which they desire, purchase, only to discover that, for reasons depending upon climate, soil or temperament, the animal suits in this one respect, but fails to fill the bill in every other. Such mistakes may be avoided by a little inquiry into the origin and habits of the breed in question. Some being natives of Northern countries, will, of course, thrive in our Northern and Northwestern States; others coming to us from the South of Europe, would find a more congenial home in the Southern States of the Union. It will be remembered that in recommending the introduction of improved stock more largely into the State, we have confined our recommendation, at least for the present, to the question of *males*, so far as the farmer and feeder are concerned. It would require too much outlay to undertake at once to replace all the stock in the State with thoroughbreds of one description or another, and the question of expense alone would at once stamp such a proposition as unfeasible. What we desire is, to impress upon the farmer the necessity for practical recognition of our past neglect, in the immediate effort to improve our stock generally, and at the same time as rapidly as circumstances will admit. The following remarks upon special breeds of horses, cattle, sheep and swine, will be of service to the prospective breeder in making selection of breeding stock.

HORSES.

THE THOROUGHBRED OR ENGLISH BLOOD HORSE.

There is no kind of horses claiming peculiar merit before the public that does not, more or less, base its claims upon recent or remote consanguinity to the English thoroughbred. Descended from imported Arabians, in the hands of intelligent English breeders, he has advanced step by step to the top of the ladder, and is now conceded to be the truest, noblest and pluckiest of the equine kind. On the turf his fame is unrivalled. His courage and powers of endurance have been tested on many a field, and he has found no peers. He thrives in all countries, bears equally well the heat of the South and the cold of the North, and where even his blood is infused into the veins of less noble specimens of his race, it produces results to be obtained in no other way. Courage, power, endurance, are his characteristics—and to him only do they belong in the highest degree. He is the progenitor of the trotter—has improved the Suffolk and the Percheron, and various other kinds for draft and road, and is to-day performing an important part in the improvement of our horse stock all over the country. We would not, candidly, recommend the use of the thoroughbred horse for general purposes upon the farm. They are high-strung, of a very nervous temperament usually, and while under kind treatment, they will perform their labor efficiently; it not unfrequently happens that a mistake in early handling will ruin their tempers, and make them balky and sulky. We know that the blind admirers of thoroughbreds place them at the head of the list, even upon the farm, and give unanimous examples to sustain the truth of their faith. We would prefer half, or three-quarter bred horses, in the hands of the average farm-hand—and have reason to believe we are right. In that portion of the State where the horse stock has been allowed to run down, as is the case in many localities, the immediate introduction of thoroughbred stallions would accomplish a world of good. They should be selected for size, form and blood, and could readily be obtained at low prices in Kentucky, where broken down turf horses can often be purchased for a song. We have heard it asserted by planters in Tennessee, that mules from thoroughbred mares would do more work, and would do it better, and keep at it longer, than nine-tenths of the cold-blooded horses of that State—only another proof of the efficacy of blood.

THE TROTTER

Is the American horse *par excellence.* Before his appearance upon the American turf he was scarcely known. That remarkable power, now so well recognized, which enables a medium sized horse to pull a wagon along at a three minute gait, was as rare a thing a few years ago as now it is common. Judicious breeding, long and patient training and modern conveniencies, have continually increased the trotting speed, until we see Goldsmith Maid and Fullerton, and Red Cloud, and Occident, and a host of other flyers, clipping it along in something less than 2:20—exciting the admiration of the world by their unrivalled speed and pluck and power to stay. Breeding trotters has become very common over the entire country. In almost every State studs have been established, and "promising young ones" are announced as "coming on." In fact, of late years we think the thing has been overdone. There have been too many young ones coming on that came to naught, and speed, in addition to fashionable pedigree, is a requisite to secure a fancy price. We look upon breeding trotters for speed alone, as rather a risky business. It is a lottery, in which the prizes are few and far between, and blanks are drawn uncommonly often. But, leaving out the question of speed, there is good reason to believe that taking him all and all, the American trotting horse is the very best type for general use in the country. He can be bred large, has plenty of muscle and bone, a large infusion of thorough blood, and is game, and docile and quick. Many persons have an idea that a trotter to be a trotter, should be small and dumpy, that he should be put up pretty much after the fashion of the Queen of the Turf, and that fair size is imcompatible with great speed. This is simply a mistake. Lady Thorn and Gloster, and their like, prove the fallacy of such teaching. Were we desirous of establishing a breeding stud, to raise colts for the Turf, for the road, and for general draft, our first step would be to secure a sixteen-hand stallion, closely inbred to Mambrino Chief, and possessing a fair share of thorough blood. He should be of good color, bay preferred, of good form; sound of limb and kind of disposition. If he had trotted fast himself and could show a few good colts doing the same, all the better. Such a horse should be bred to mares of fine size and good blood—mares that could carry a large foal and would bequeath no unsoundness, nor bad trait to their produce. We believe that such a basis would promise better for the success of the breeder than if he were to accept many of the new-fangled notions which seem to be gaining ground in regard to the merits of the heavy draft horses of France and England. We do not want too much size or weight, especially if to get them we must sacrifice other more desirable qualities. A well formed sixteen-hand horse is large enough—he might be even a little lower, if compactly built, to advantage. In breeding trotters, when the requisites above given are complied with—the breeder has good reasons for knowing that he will secure a fast turf horse, a good road horse, a stylish carriage horse, or a hack horse, good, in an average way, for any work to which he may be put. If the first, he brings a very large price; if the second, a more than average price; if the third, a good price; and if the fourth, he will bring as much as any other of the same grade, and it costs no more to raise him.

Taking this view of it, breeding trotters may become a very profitable occupation. We doubt if nine-tenths of those engaged in the attempt to secure speed alone; make a living. It requires an unusual number of good ones to pay for finding out how many bad ones there are in a batch of colts.

DRAFT HORSES—PERCHERONS.

Of recent years Percheron horses have been imported in large numbers into the United States and Canada. They are large beasts, ranging in size from 15½ to 17 hands high, and weighing a marvellous number of pounds. Their native country, La Perche, France, borders upon Normandy in the same country, and for this reason they have not been unfrequently confounded with the well known breed of horses from the latter place. While we have heard the praise of Percherons sounded from many different quarters, we have yet to learn that they posses any inherent good qualities not allowed to other breeds, other than immense size and great weight, two characteristics which we will be excused for thinking a little overdone in their case. They are generally dappled gray in color,* and of fine appearance. Huge crests, shaggy mane and tail and immense hoofs. Their admirers claim for them considerable speed and endurance, for animals of their size; but evidently the roads must be hard and good that would admit of the rapid passage of such huge beasts, without more than ordinary consumption of wind and muscle. We are told that the breed is being rapidly improved under the auspices of some of the most intelligent breeders in France, and that, while an effort is being made to confine these horses to one color—black—thorough blood is being largely introduced into the studs of LaPerche, and a reduction of weight, and increase of muscle and compactness of form is gradually superceding the fleshiness which now characterizes the breed. For heavy hauling on hard roads; for city use in fire-engines, coal-wagons, etc., etc.; for all purposes where weight is the first desideratum, the Percheron fills the bill; and will doubtless command a ready sale at remunerative prices; but, in the field, for buggy and carriage purposes, for general draft in fact, we do not consider him a success, for the simple reason that there are other horses, nearer home, which more thoroughly perform the work. First class imported specimens of this breed are selling at high prices—from $1,000 to $5,000, being the figures generally obtained. In France it is said, good stallions are purchased for from $300 to $500.

CLYDESDALES.

The objections urged against the Percherons for some uses, and what has been said in their favor for others, applies with almost equal force to the Clydesdales. The latter hail from the county of Lanark, Scotland, and are the "hewers of wood and drawers of water" for the extensive manufacturing and mining district of Glasgow. They are of various colors and of great size; move easily along with the largest loads, and are noted for the length and steadiness of their stride. They are supposed to have descended from the old black draft horse of England, and claim an infusion of thorough blood. As said of the Percherons, their sphere of usefulness would seem to be on hard roads, or in the vicinity of large cities. Certainly, such animals would not live through a long day before the plow without great inconvenience to themselves, and an unusual amount of unnecessary labor. They, too, are bringing very high prices, under the mania for big horses, and are being quite extensively introduced into the Western States. It remains to be seen what will be the result of crossing these heavy draft stallions upon our native mares. We have seen several specimens of the cross, and, while, in one instance, the colt was a smooth, well-formed, easy-moving animal, we thought we discovered in the others a clumsy ugliness which did not promise well. It may be safe to try the experiment with large, roomy mares, but we are satisfied that no possible benefit is to be obtained in the effort to raise a serviceable colt from so violent a cross. The product of a Shanghai and a Bantam would be quite as likely to be active, and graceful, and quick.

SUFFOLK PUNCHES.

This breed of useful horses has not gained a very strong hold upon the affections of Americans, as yet, but they stand deservedly high among the English, and when we are able to distinguish between monstrosities and size, combined with strength and courage, we will, in all probability, give them a higher place in our esteem. The Suffolks are noted for their pluck and strength. As their name indicates, they are *punchy*—every muscle is in the right place, and it is a subject of wonder to see the immense loads they will haul with comparative ease. While we do not advocate the improvement (?) of any breed by crossing it upon coarse draft stallions, we lean to the opinion that, of the three breeds mentioned in this article, the Suffolk would add more to the value of the horse stock of the country than either of the other two. They are large and heavy enough, are easily kept in fair condition, are, more than either of the others, noted for their courage and endurance, and are proverbially docile and well-tempered.

The horses above enumerated are the only ones of any repute which deserve mention as a separate class. There are famous strains of thoroughbreds and trotters—Abdallahs, Mambrinos, Hambletonians, and a host of other trotting families, have their advocates and admirers, but still they are *trotters*, and are only worthy of special notice as being the strains which have furnished the greatest number of runners on the turf. In selecting breeding animals from among the produce of noted trotting sires, pedigree should not play too important a part in influencing your decision. Pedigree is very essential as evidence that the desired amount of blood is possessed by the animal, but the results of recent years have satisfied the most incredulous that all the hot is not monopolized by one or two families, and that where the chances are equal, trotters will break out almost anywhere. The main thing is to secure animals well bred, of good size, color and temper, and if their ancestors have proved their excellence in one field or another, we may expect their produce to exhibit an excellence in the same sphere.

CATTLE.

BEEF BREEDS.

THE SHORT-HORNS.

It is unnecessary to give any detailed account of the origin and history of these celebrated cattle. Wherever beef is consumed—and where is it not?—they have played an important part in supplying the wants of man. They are known, from one end of this country to the other, as the Royal Family among cattle; and no breed dares dispute with them their merited position as the head of the list. The Short-horn has been termed the rich man's breed; and at present prices, the "fancy" of his kind, could scarcely become the property of a poor man without bankrupting him. There is a mania, just now, for Dukes and Duchesses, and matter-of-fact farmers are disposed to discover something fishy about the immense prices realized, at recent sales, for numbers of this family.

There is no reason, however, why we should mark a man a fool because, for reasons best known to himself, he chooses to invest a large sum of money in a small amount of beef. He may have lights before him which have not shone upon us, and, although we may not choose to go and do likewise, we have no special interest in the matter, and can act upon our own instincts. We cannot indulge ourselves with such expensive luxuries as Duchesses and Dukes; but we can, at a small outlay, replace every scrub bull, that ranges the prairies, with a well bred yearling or two-year-old Short-horn; that will commence the era of reform from the time he steps among the herd.

The natural home of the Short-horn is on the rich grass-lands of the West. Here he thrives amazingly; at two years old he has so waxed in strength and fatness, that he is prepared for the shambles—when the scrub-stock of the country is lingering still between beef and veal. That is what we want—aptitude to carry flesh, early maturity, weight; without these no man can raise beef at a profit.

The modern Short-horn is not a milker, although descended from the most noted dairy cows of the last century. Breeders have so entirely lost sight of the dairy qualities of the animal, in the effort to secure symmetry of form, and a propensity to fatten, that it is now customary, among many of them, to "nurse" their calves with cows kept for the purpose—the mother not being able to afford sufficient nourishment. These, however, are fancy notions, which are not expected to meet much favor on the prairies; and bulls, selected as breeders for the farmers "out West," would seldom have time to brush up for exhibition at the fairs, and the dams of their young ones would have no difficulty in suckling them, being neither of aristocratic lineage or delicate constitutions. The grazing portions of the State should be well supplied with good Durham blood; and, if it could be gradually accomplished, without too violent an interference with the rights of individuals, we would favor the castration of all the little pestiferous ill-shapen Texas bulls that dare attempt to repeat themselves.

HEREFORDS,

As their name indicates, came from Herefordshire, England, and are the only prominent rivals of the Short-horns, in size and aptitude to carry flesh. They are a large, long-horned cattle, of peculiar color—white about the face, belly and legs, the rest of the body being bright red. They have not succeeded in exciting much enthusiasm in the United States; though recent sales show that small herds have been carried as far west as Colorado, and seem to meet with favor. Their admirers give statistics to show that they have, in many instances, competed successfully in the same rings with Short-horns, at English fairs; and the small amount of food they require to keep in good condition, and their grazing qualities, are urged as reasons for their more especially answering the wants of the practical farmer and grazier. Our experience, or knowledge, in regard to Herefords amounts to little or nothing. It has been said that they would keep fat where a Short-horn would starve, and a Devon grow thin; and we are told by a gentleman who has bred all three that, from his experience, he has no reason to doubt the truth of the assertion.

DEVONS.

We consider the Devons as occupying the same relative position, among cattle, that the Southdown does among sheep. He is the hardy, active, square-bodied, compact little beast that stands between the giants and the pigmies; requiring little nursing; able to take care of himself, and yielding, yearly, an ample return for all the food he consumes. They are of a dark-red color, with wide-spreading, straight horns; breed and mature earlier than the larger kinds of cattle, and are particularly desirable on poor pasture lands, where activity is necessary to enable an animal to earn his daily food. Their flesh is said to be superior for beef—the lean and fat being well mixed; its flavor good, and grain compact. Devons have been much improved of late years, and they frequently enter the lists, in England, in competition with Short-horns and Herefords, and carry off their share of the prizes.

There are many other kinds of English cattle, more or less esteemed, such as the West Highlanders, Polled Galloways and Sussex; but few of these have found their way to America, and do not stand in the front rank with those already mentioned.

DAIRY BREEDS.

THE HOLSTEIN OR DUTCH COW.

Although there seems to be some difference of opinion existing between the breeders of this stock in the United States upon the subject, there is no doubt that it originated in North Holland, and that most of the animals, known as Holsteins, were imported from that section of country. This breed has long been famous for its milk-producing powers, and some of the accounts which come to us of their performances at the pail, border upon the marvelous. They consume large quantities of food, and carry little flesh when in milk; when dry, it is said, they lay on fat with rare rapidity, and for this reason should exactly suit the milk dairyman, who buys his cows in milk and sellls them when dry to the butcher. The Holsteins are large, well-turned cows, with crumpled horns of medium length, large udders, and are usually black and white in color. The number of Holstein breeders in the United States is comparatively small. It is only of late years that much attention has been given to this useful kind of dairy animals, but if all we hear of them be true, the time is not far distant when they will become the most popular and generally distributed milk cattle in the country. A Herd Book for the record of Holstein pedigrees is published under the auspices of the Association of Breeders, in Massachusetts. Should any of our readers desire further information upon the subject, they can obtain it by addressing W. W. Chenery, of Belmont, Massachusetts, the President of the Association.

AYRSHIRES.

The Ayrshire, if not the best dairy cow, is certainly the most fashionable and popular, just now. She is the result of intelligent breeding, long continued in the noted dairy district of Ayr, Scotland; and, it is claimed, that her milk will produce more cheese to the pound than that of any other breed of cows. The quantity of course varies with circumstances, but, all things being equal, her admirers assert, with show of reason, that she will yield more milk to the amount of food consumed than any of her rivals. Ayrshires are medium sized, wedge-shaped cattle—ordinarily red, or brown and white—with fine heads, upright horns, slightly curving in, and broad straight backs. Their udders should be square, running well forward, and teats set widely apart. The shortness of the teats has been frequently urged as a strong objection to the breed. A defect, however, which would not amount to a great deal, if the flow of milk is constant and in sufficient quanties. Ayrshire steers fatten readily and make good beef. While not prepared to compete with Short-horns or Herefords, they will command good prices in the market and make a fair return for what they consume. An Ayrshire cross upon native stock would result in decided improvement, and when the produce is intended for general purposes, we would highly recommend it.

JERSEYS OR ALDERNEYS.

It has not been very long since, when, to have advertised the merits of these little animals, whose distinctive name we have just written, would have secured a laugh of derision from an audience of western breeders. Alderney was synonymous then, and is still to a certain extent, with self-satisfied would be wiseacres, with everything little and ill-shapen and scrubby in the cattle line. "*Them* little yaller cattle," as they are derisively termed, have nevertheless, by dint of sheer merit, pursued their way along the line of emigration, until individuals of the breed are owned and esteemed from the Atlantic to the Pacific.

The Jersey is small, bony and active. She varies in color from almost black to brown, gray, faun, and light red, these colors being variously mixed with white in various animals. She is hardy, very prolific, and matures early; she is noted for a deep yellow skin, and stands unrivaled as the butter-maker of her kind. Jersey bulls crossed upon native cows produce the best family cows, all things considered, to be had. They grade up rapidly, and it is frequently difficult to detect any difference between a half, or three-quarter bred animal, and a thoroughbred. As "little" and as "yaller" as they are, they admit of no rivalry in their chosen sphere. They have generally been derided by beef breeders since time immemorial, for their inaptitude to carry flesh, a high recommendation to any who have studied intelligently the characteristics of good dairy cows. By some, the Jersey has been compared to a goat that gives a quart of rich milk, and is otherwise good for nothing—a quart of rich milk is better than a quart of blue milk, at any rate—but a little enquiry will satisfy the most incredulous that modern Jerseys not only produce an unequaled quantity and quality of butter, but that their flow of milk is quite as large as that of the other breeds, in comparison with their size and the amount of food they consume. A recent letter from B. F. Johnston, the old and reliable correspondent of the *Country Gentleman*, calls attention to the fact that Jersey milk is, more than that of any other breed of cows, devoid of casine, the most indigestible ingredient of milk. He draws from this fact the conclusion, that, for the use of families, and especially of children, it should be preferred to all others. In the vicinity of large cities, towns and villages, wherever the great desideratum is a fair quantity of rich milk at little cost, the Jersey cow will "pay." The grades as already said, are excellent family cows, and are fast superseding natives, where their good qualities are known and appreciated. It is as well to state here, as elsewhere, that in breeding cattle we must set aside partialities and fancies, and secure what we know will answer our wants, without regard to the opinions, so strenuously asserted, of men who have run in their ruts until they can't see over the sides. It would be asking too much to expect a grazier or butcher to admire a Jersey, as it would be to expect a dairy man to look for his milk supply from a Texas steer. It is well to remember that animals bred for special purposes are more apt to accomplish special ends—jacks of all trades are good for none. The Jerseys, Alderneys and Guernseys differ in no material respect. They are the same race of cattle, coming from the three islands, Jersey, Alderney and Guernsey, as indicated by their names. By far the greater proportion of these cattle in the United States, hail from Jersey; in fact, the American Jersey Cattle Club, by whom the matter of pedigrees is regulated, will admit none that cannot be traced back to animals imported from that Island.

SWISS CATTLE.

The cows of Switzerland have long been noted for their superior dairy qualities, and have, in a few instances, found liberal admirers who have imported them to this country in small numbers. Several fine herds are owned in New England, and judging from the soil and climate of their native country, we should consider them particularly well adapted to that part of the United States. Our information concerning their success in America, is limited, for the reason that their owners have taken no pains to make the public acquainted with their merits. They should be profitable in the broken and rather mountainous sections of this State.

SHEEP.

THE MERINOS

At one time so popular in this country, especially in the staid old State of Vermont, are natives of Spain. The Spanish, French, Saxon, Silesian and American Merinos, are all descended from the same parent stock, and differ very little in general characteristics. They are famous for their very large annual yield of the finest quality of wool, and at one time were sought after with such avidity by sheep-breeders of New England, and more especially of Vermont, that single rams brought from one to five thousand dollars, and were let to ewes at from five to fifty dollars per head. Any one who has seen a Merino, will accord with the popular opinion, that he is anything but a handsome sheep. But, especially in southern climates, he performs an important part in his annual addition to the wool supply of the world, and when crossed with the Downs, or long-wool families, produces a good mutton sheep—hardy, active and easy to keep. Randall, the great authority on sheep-husbandry, recommends the Merino as *the* breed, above all others, for Texas, Louisiana, and our other Southern States. They stand heat and drought well, herd in large numbers without danger of disease, and although not up to other breeds in this regard, produce a fair quantity of good mutton.

LONG-WOOLS.

COTSWOLDS.

This well-known breed, large numbers of which are being constantly introduced into the United States, originated in the valleys of the Thames and Severn, and were first imported here in 1840. The Cotswolds, of late years, have been very much improved by crossing with the Leicester, and are now undoubtedly the most popular of the long-wool breeds. They are very large, with long and flowing fleeces, short legs set under square, broad bodies, well wooled all over. They are prolific, and good mothers, seem well adapted to the soil and climate of all sections of the country, and while being remarkable for their large wool product, are none the less so as mutton sheep, especially for raising early lambs, which mature with rare rapidity. The Cotswolds are hardy, and sufficiently active. They, like other of the large breeds, do better upon rich, lowland pasture, and thrive better in small flocks. The rams are crossed upon our native sheep with the most beneficial results, producing a sheep possessing many excellent qualities for general use.

THE LEICESTERS.

We are indebted to the patient breeding of Mr. Bakewell, of England, for the new Leicester breed of sheep, which is esteemed as the fountain head, we may say, from which nearly all the long-wool families have drawn their best points. The old Leicesters were a large, coarse sheep, and it was not until after some crosses with other breeds, and long-continued selection, that Mr. Bakewell succeeded in giving us the comely, valuable member of the long-wool family now known as the New Leicester. Mr. Youatt, in his interesting work on sheep-husbandry, thus describes the Leicester: 'The sheep are without horns, with white faces and legs; the head small and clean the eye bright; neck and shoulders square and deep; back straight, with deep carcass; hind-quarters tapering towards the tail, and somewhat deficient when compared with the Cotswold sheep; legs clean, with fine bone; the flesh is juicy, but of moderate quality, and is remarkable for the proportion of outside flesh it contains. They are not considered so hardy as the other large breeds, and require shelter and good keep. The ewes are neither very prolific nor good mothers, and the young lambs require great attention. Early maturity and aptitude to fatten are the principal characteristics of the breed—a large proportion of the wethers finding their way to market at twelve or fifteen months old, and weighing from 80 to 100 pounds each. The wool is a valuable portion of the flock, the fleeces averaging seven pounds each." From the foregoing, it will be observed that the Leicester, while possessing many excellent qualities, lacks others, which would give the precedence to the Cotswold as the sheep for the general farmer and wool-grower.

THE LINCOLNS

Are just coming into fashion—so to speak—and seem to be in especial demand among Australian wool-growers. Recent public sales, in England, have developed the fact, that they will bring just a little more than either Cotswolds or Leicesters—and the great improvement which has been made in the breed, of late years, will doubtless make it popular permanently, wherever mutton and wool are marketable products. They are a coarser sheep than either of the foregoing, and are especially hardy, prolific, and produce an excellent quality of wool, weighing from six to ten pounds to the fleece. The Lincolns have not been imported into the United States to much extent, and, in fact, are scarcely known here—a few breeders in the far east have them for sale at prices which would indicate that they placed a very high value upon them.

(NEW OXFORD'S OR IMPROVED COTSWOLD'S.)

Are nothing more or less than a cross of old Cotswold's and Leicesters, and are no more improved Cotswold's than they are improved Leicesters. They are very much esteemed in Canada, as any one who visits the St. Louis Annual Fair may learn, upou inspecting the pens of Craig, of Edmonton, and other breeders. While gaining much in personal pulchritude, early maturity and aptitude to carry flesh, the improved Cotswold has lost some of these characteristics which recommended his Cotswold ancestry to the practical farmer above all other breeds.

He is thus described by Mr. Lawrence Smith, of Middlefield, Massachusetts, in 1860: "I doubt whether they are as hardy as the old-fashioned Cotswolds or South-downs. I have never had any trouble with them in regard to cold weather or changes of climate—indeed they prefer an open, airy, cool situation, to any other, and nothing is more destructive to their health than tight, ill-ventilated stalls. My present experience warrants me in saying one-half the ewes will have twins; they are capital nurses and milkers. I have not had for the past seven years a single case of neglect on the part of the dam, nor have I lost a single lamb for lack of constitution. Suckling ewes will weigh in stall condition from 125 lbs. to 175 lbs.; fat wethers, at three years old, from 175 to 250 lbs. My heaviest breeding ewe last winter weighed 211 lbs. My stock of stall sheep and breeding ewes generally shear from five to seven lbs. My ram fleeces sometimes weigh ten pounds, unwashed, and will sell in this condition for twenty-five cents per pound. I never feed any stall sheep and lambs with grain, but give them early cut hay and occasionally a few oats.

THE DOWNS.

SOUTH-DOWNS.

At the head of the list of mutton sheep, in the esteem of English and American breeders, the South-down stands pre-eminent. These sheep owe their many merits to the untiring patience and intelligent breeding of Mr. Ellman, of England, who, beginning with a small, ungainly animal, succeeded, after many years, in producing the square, thick-set, nobby South-down of the present day.

We quote from Randall's *Sheep Husbandry* Professor Wilson's description of the modern South-down: "The South-down sheep of the present day are without horns, and with dark-brown faces and legs; the size and weight have been increased; the fore-quarters improved in width and depth; the back and loins have become broader and the ribs more curved, so as to form a straight and level back; the hind-quarters are square and full, the tail well set in, and the limbs shorter and finer in the bone. * * * * * The sheep, though fine in form, and symmetrical in appearance, are very hardy, keeping up their condition on moderate pastures, and readily adapting themselves to the different districts and systems of farming in which they are met with. They are very docile and thrive well, even when folded in the artificial pastures of an arable farm. Their disposition to fatten enables them to be brought into the market at twelve or fifteen months old, when they average eighty pounds each; at two years old they weigh from one hundred to one hundred and twenty pounds each. The meat is of fine quality, and always commands the highest price in the market. The ewes are very prolific and are excellent mothers, commonly rearing one hundred and twenty to one hundred and thirty lambs to the hundred ewes. The fleece, which closely covers the body, produces the most valuable of our native wools. It is short in the staple, fine and curling, with spiral ends, and is used for carding purposes generally." In other words, the South-down is everything any one could ask a sheep to be, and will pay well for his keep, no matter where he may be called upon to do so. In consequence of his compact form and aptitude to fatten, he thrives well upon the shortest pastures, and the cross of no other breed does so well upon our native ewes. The South-down is the immediate progenitor of all the other Downs, and has marked them all so that the origin of their best points cannot be mistaken.

SHROPSHIRED-DOWNS.

Some noble specimens of this breed were exhibited at the late St. Louis Fair by Mr. Allen, of England, who has, for many years, been engaged in perfecting his flock of pure-bred Shropshires. We believe that, possibly, with few exceptions, Mr. Allen was the first breeder to bring his sheep west of the Mississippi river. The breed is, therefore, very little known in the West. The Shropshires are thus described by Judge Chaffer, of Canada, in answer to inquiries made by Mr. Randall:

"They are nearly as large as the long-wool breeds—say Cotswolds or Leicesters—and yield just about the same quantity of wool, and are, in my judgment, much more hardy and healthy. They have the dark-colored leg and face of the South-down; much longer, thicker and more compact fleeces than the South-downs, and much thicker and more compact ones than the long-wool breeds. They have all the nice, round, compact frame, and even, uniform symmetry of appearance of the South-down, and are almost 33 per cent. heavier. I have never slaughtered any of this breed, and cannot speak from personal knowledge of the quality of their mutton, but it is said by those who do know to be very superior, and hardly to be excelled by the South-down."

Mr. Allen, above alluded to, sold several rams to farmers in St. Louis county, who, it is to be hoped, will give their opinions of this breed of sheep to the public, after thoroughly testing them as mutton and wool producers. If all that is said of them be true, they should supersede the pure Downs in consequence of their greater size and larger yield of wool.

HAMPSHIRE-DOWNS.

This breed originated in Hampshire, England, and is supposed to be a cross between pure-bred South-downs and the native sheep of that section. They are thus described by Mr. Randall:

"Their leading characteristics are, as compared with the South-down, immense size, equal maturity and a hardier constitution. The face and head are larger, and coarser in their character; the frame is heavier throughout; the carcass is long and roomy, though less symmetrical than the South-down. These points have all received great attention lately from the breeders, and the improved Hampshire-down now possesses, both in shape, quality of wool, aptitude to fatten and early maturity, all the qualities for which the pure South-down has been so long and so justly celebrated. The lambs are usually dropped early, and fed for the markets as lambs, or kept until the following spring, when, if well fed, they weigh from 80 to 100 pounds, and command a good market."

OXFORDSHIRE-DOWNS.

The Oxfordshires are the result of a cross between the South-down and Cotswold, and have only of recent years claimed distinction as a separate breed. Their legs and face are of a lighter color than those of the South-down, running more to gray than black or brown. They are well formed, and answer every purpose as a mutton and wool sheep.

The Oxfords, Shropshires and Hampshires are very little different in general characteristics, and any one of these breeds would fully come up to the standard of requirements of the sheep-breeder in Missouri. Rams selected on account of individual excellence, and crossed upon native ewes, would add qualities to the average sheep in every way qualified to increase their market value. Whenever the Missouri breeder recognizes the value of these improved crosses, he will have taken an important step in the right direction.

HOGS.

THE BERKSHIRE,

Originating in Berks county, England, the progenitors of the modern Berkshires, were large, course hogs, of a black, white and sandy-spotted color, possessing in themselves no peculiar merit not accorded to other breeds of their day. By patient selection and the infusion of Essex, Chinese and Neapolitan blood, the Berkshire has advanced in the esteem of swine breeders, until he has become the most generally distributed, and by odds the most popular of all breeds with the American farmer. He is a good grazier, hardy, and unusually free from disease, carries flesh at any age upon a limited supply of food, and not unfrequently produces 400 pounds of good pork at two years of age. Being a black hog, the Berkshire suffers less from skin diseases, such as mange, scald, etc., than the white varieties. He is prized especially for his adaptability for crossing upon natives and other pure breeds, and imparts his good qualities with rare certainty to his progeny. In fact, the pigs by a pure Berkshire boar, from a native sow, frequently so nearly resemble thoroughbreds, that dishonest breeders sell them to innocent purchasers as such, thus detracting from the reputation of the breed and breeder, as mongrels will invariably breed back and expose the fraud. The immense amount of money invested in pork packing in the United States has had a very beneficial effect in making an improvement in the character of our hog stock. The old razor-backs of some years ago are gradually becoming things of the past, and in their stead a fair grade hog, possessing nearly all the good points of his thoroughbred ancestor, makes glad the hearts of the packers, and puts ducats in the purses of the feeders. The Berkshire has been the source from which the greater part of this improvement has been obtained. True, other breeds have performed their part, but no one of them has done so much, nor deserves so well of farmers, feeders and packers.

THE POLAND AND CHINA OR MOORE HOG.

This is a cross-bred hog, having a little of the blood of a half dozen different breeds coursing through his veins. He is essentially of American origin, and is known in different parts of the country as Poland and China, Moore Hog, Magie, and Butler County. Early maturity, aptitude to fatten, and immense size, are his principal distinctive characteristics. Some of this breed, exhibited at the St. Louis Fair, have weighed as much as 1,100 pounds gross, and were the most perfect monsters of the pork kind we have ever seen. Some years ago breeders of this variety of swine were very prolific of newspaper articles sounding its praises; of late years, however, we hear less of them; and, while the breed undoubtedly possesses much to recommend it, it is reasonable to suppose that public opinion is right in giving the preference to the Berkshire for most practical purposes. The Poland and Chinas are of a white and black color, about equally divided, and are said to have resulted from a harmonious blending of the best of the largest and smallest varieties of established breeds. As their name indicates, the Chinese hog was extensively used in the first crosses. The Chinese swine are of two distinct varieties—the white and black—differing very little in other respects. They are small, never attaining any great weight, but are round-bodied and fatten readily. They have been of great service in the improvement of the European breeds, and there are none of the latter which do not in a measure trace their excellence to them. A contributor to the Agricultural Report of 1873 enumerates, as follows, *his* reasons for prefering the Poland and Chinese hog to all others:

First—That as breeders they are notably prolific, it being common for young females at their first bearing to produce a full, even litter of from nine to twelve fine pigs.

Secondly—They are uniformly, perhaps invariably, kind and careful mothers and copious nurses—qualities which produce a strong prepossession in their favor from experienced breeders, and in which their black rivals are conspicuously deficient.

Thirdly—They are healthy, vigorous and hardy to a remarkable degree, and entirely free from mange and other cutaneous affections, bear the intense cold of our winters and the heat of our summers with equal indifference, and in this respect are undoubtedly the best breed that can be propagated in Nebraska.

Fourthly—They are well and favorably known for their great docility and quiet, tractable habits, thus greatly diminishing the care and labor necessary to keep them in their confines, and enabling them to appropriate their force to the laying on of flesh and fat, instead of expending it in useless and unprofitable motions about the pen and field—an important consideration, when we reflect on the uneasy movements of many of the lighter breeds. Being docile and of a quiet disposition, they are peculiarly susceptible to the influence of good feeding, and under such influence make a most rapid and satisfactory gain.

Fifthly—They are the earliest matured of all the large breeds, deriving as they do, from an infusion of Big China and Irish Grazier blood, the capacity to fatten at any age, from four months to three years. They have been made to average, in lots of thirty head and over, at eleven months old, dressed, from 389 pounds to 410 pounds.

Sixthly—They attain the heaviest weights. No other large breed can compare with them, except, perhaps, the Chester Whites, which have too many deficiencies to ever become a predominant breed in Nebraska.

CHESTER WHITES.

This, at one time, very popular breed, first appeared in Chester county, Pennsylvania, and was probably the result of crosses of the large and small breeds of White English swine. Numbers of them were shipped to all parts of the United States some years ago, and no farmer was happy unless he was the owner of a good Chester sow and boar. The demand for them was such that many persons palmed off meagre hogs for thoroughbreds—purchasers seeming to be perfectly well satisfied if the animal happened to be only white. The consequence is, that while the real Chester Whites are still highly prized by those who have them in their purity, there is little demand for them among the most of farmers at present, and other breeds seem to have usurped their temporary popularity. The Chesters are large white hogs, with plenty of crisp, curling hair, and rival the Poland and Chinas in size and weight at maturity. It is urged by many who have had experience with them that they are "slop" hogs; will not do well as graziers; are not active, and will not fatten when young. Others again claim all the merits a good hog can possess for them. Their decline in popular favor would seem to indicate that the former were nearer the truth than the latter.

THE YORKSHIRE

Is the large white breed of England. Originally long-legged, with lengthy snout and bristling hair. He has gradually changed his appearance under the system of modern breeding, to a round-bodied, short-legged, thin-haired hog, which will produce a good article of pork at little cost, weighing from 200 to 250 pounds, at fifteen months old. These hogs are also called Cheshires, and have figured in the hands of their admirers from year to year at the St. Louis Fair, bearing off many premiums. The great prize given by the pork packers was awarded to a pen of these hogs two or three years ago, over all other competing breeds. The fashion seems to be for black hogs, however, and no matter what may be the good qualities of a breed of swine, it makes but little headway in the esteem of farmers if its color is white.

SUFFOLKS,

Another white breed, well formed, of fair size, with round, short bodies, short legs, very small heads and an unusual amount of jowl. The improved Suffolk is nothing more than the old breed of that section of England, crossed with the Chinese. It is not unusual for them to weigh from 200 to 250 pounds at fifteen months of age, and the sucking pigs are considered especially delicious for the table, on account of the delicate whiteness and flavor of their flesh.

THE ESSEX.

This breed, like the Berkshire, has been improved by crossing with the smaller breeds, such as the Chinese and the Neapolitan, and has assumed more compactness of form with its reduction of size. The Essex is a black hog, with pendant ears, and is noted for its fine skin and soft hair. A cross of the Essex is supposed to have added largely to the good qualities of the modern Berkshire, and even now many breeders hold the opinion that a cross between the two pure breeds produces a better hog for all purposes than either of its parents. Some very choice specimens of the Essex breed have been imported into the United States, but have not succeeded in competition with the Berkshire in securing extensive popularity.

The Byefield, Woburn, Irish Grazier, and a host of other varieties, have been in more or less esteem in past years, but have gradually yielded the palm of excellence to the smaller and more compact breeds.

The farmers of Missouri will observe from what has been written above, that, be it horses, cattle, sheep or swine, which engage their attention, there is little doubt that they may work great improvement to their live stock interests by the intelligent use of males from any of the breeds of animals described. It will not do "to go it blind" in such matters, for the reason that we all have special ends to attain in breeding for our special markets, and supposing the object in view be to breed beef, it would assuredly answer no good purpose to use a Jersey bull any more than in the attempt to secure a large yield of butter; it would be wise to depend for such upon the service of a Short-horn. Each breed has been bred, and wisely so, for an end. It would be impossible to concentrate all the most desirable qualities in one animal, for the reason that many of these qualities are dependent upon diametrically opposite circumstances for their existence. It requires different powers and the strengthening of different muscles to enable a horse to run from what it does to trot. The food which goes to the production of flesh cannot be expected also to make milk, cheese or butter; so that in selecting breeding stock we should, without bias, consider our climate, soil, markets and surroundings before giving preference to any one breed over another.

SOILING OR PASTURING.

The agricultural press has discussed the relative merits of these two systems of feeding, in their bearings upon different sections of the State. In the abstract, doubtless, soiling is by far the least wasteful of the two. An acre cultivated in green forage will produce more food than one pastured from year to year, and where land is very high priced and range is limited, it becomes a necessity if the attempt is made to keep any number of stock. In the East, where labor is plenty and comparatively cheap; where land is high, farms small and markets convenient, soiling is in vogue to a very large extent. Large numbers of breeding animals are kept upon a comparatively small area, and a few men have presented figures which prove undoubtedly that, so far at least as they are concerned, soiling is much the most profitable. The manure collected in the stock yards is an important item in the estimated benefits secured, one which would not be of near so much importance on the virgin soil of Missouri. The fence question, so generally discussed by all classes of our citizens a few years ago, very naturally included a consideration of the merits of soiling as opposed to pasturing. We then held, as we do now, that these matters should be determined by the people of the different counties, as they are better able to properly understand their own interests than we, for instance, of St. Louis, who, were the question settled by a general vote of the State, would vote ourselves a benefit and our neighbors an injury. A stock law in St. Louis county, requiring every man to fence against his own stock, is, for obvious reasons, a just and beneficial enactment, considering the interests of the mass of our people. Our farms are small, our land high and little of it left uncultivated, and any one who turns his cow or hog upon the highway does so obviously to permit it to starve or depredate upon the inclosures of his neighbors. There is no life for it otherwise. The same thing holds good in the case of any other thickly settled section of the State. There are, however, counties within the boundaries of which large tracts of rich pasture lands lie open the year around, where hundreds of animals may sustain life for many months in the year simply by grazing, and it would certainly work injury to the material interests of such counties to prohibit stock from being herded upon these natural pastures. In such counties, for the present at least, fence laws and soiling are out of place. We all have certain inalienable rights, and the law should protect those owning no live stock from depredating animals, the property of their neighbors. It behooves us, however, to yield to the greater interests of the majority of those among whom we live, and while the law should protect us from material loss by pointing to a legal recourse in case we suffer, it is too much, under some circumstances, to ask for protection from the bare chance of suffering. If an animal running at large where it can find abundant means of subsistence without interfering directly with the interests of others, persists, nevertheless, in going outside of its limits, the owner in every instance should be, and is, responsible for actual damage done. It would answer no really good purpose, however, to prevent a thousand quiet and inoffensive animals from grazing the same pasture because one breachy one made itself obnoxious. As said above, it is easy enough to prove by figures that an acre soiled will produce more than an acre pastured. The question with the Missouri farmer is not whether this is so or not, but whether he can profitably employ the extra amount of labor required, and confine his stock to a few acres, when he himself has an abundant range, or the the government or the land speculator has provided fine pasturage at his door. For Missouri, in her present condition, soiling and stall-feeding present no advantages over extensive herding on the natural pastures. Her hills and valleys should echo to the tread of countless herds, carrying little from the soil that they do not return, and adding yearly to the aggregate wealth of the State.

COMPARATIVE FIGURES.

In point of area and population, the principal stock-growing States of the Union are rated as follows:

STATE.	AREA.	STATE.	POPULATION.
1...Texas	274,356	1...New York	4,882,759
2...California	188,982	2...Pennsylvania	3,521,951
3...Nevada	112,090	3...Ohio	2,665,260
4...Arizona	95,274	4...Illinois	2,511,096
5...Minnesota	83,531	5...*Missouri*	1,721,295
6...Kansas	81,318	6...Indiana	1,680,637
7...Nebraska	75,995	7...Kentucky	1,321,011
8...*Missouri*	67,380	8...Tennessee	1,258,520
9...Michigan	56,451	9...Virginia	1,225,163
10...Illinois	55,409	10...Iowa	1,194,020
11...Iowa	55,045	11...Michigan	1,184,059
12...Wisconsin	53,924	12...Wisconsin	1,054,670
13...New York	47,000	13...Texas	818,579
14...Pennsylvania	46,000	14...California	560,207
15...Tennessee	45,600	15...Minnesota	439,706
16...Ohio	39,964	16...Kansas	364,399
17...Virginia	38,352	17...Nebraska	122,993
18...Kentucky	37,680	18...Oregon	90,923
19...Indiana	33,809	19...Nevada	42,491

From the foregoing it is observed that Missouri is eighth in point of area and fifth as regards population among the nineteen most important live stock producing States. By reference to the figures of the statistics, given in the Agricultural Report of 1873, we are enabled to give her her proper place as compared with the same States, in the aggregate number of useful domestic animals owned by her inhabitants, with the average value of the same:

(SEE TABLE OPPOSITE.)

Missouri has no reason to be ashamed of her progress as a producer of bread and meat, and her status among her peers as fixed by the foregoing table, is one deserving of commendation.

In estimating the value of live stock, however, it should be remembered that the statistician takes no note of pedigree or blood or speed, and after discovering the *number* of animals, he reduces every one to the level of the common, and marks a 2:20 trotter down at $65, quite as systematically as he does a common cart horse. For this reason the figures above given, so far as they apply to Kentucky, and other fine stock-breeding communities, are erroneous in the estimated value of their horse stock. The same applies to cattle, sheep and hogs. But the figures answer a good purpose, as pointing to our standing, approximately, in the list of great stock-growing States; and by giving our attention to them we may learn that there is still room for improvement in many respects? Why, for instance, should Illinois so successfully lead us in this connection? We have 10,000 square miles more than she upon which to graze our herds; our position is quite as central; our soil as fine and grass as good. Missouri is represented by the government statistician as occupying the following relative position, as compared with the nineteen States enumerated, as to numbers: Horses, 8; Mules, 4; Cattle, 4; Milch cows, 9; Sheep, 8; Hogs, 4. The lowest number represents the dairy interest, which has been allowed to languish to the great detriment of those most interested in its support. We have been accustomed to draw our supplies of cheese and butter from the east; annually expending a handsome sum, which, had our people properly considered the question, would have remained at home to add to our accumulated wealth. An immediate and practical reform in the dairy management of farmers is to be commended. Already we discover a step or two in the right direction—butteries and cheese factories are receiving attention as legitimate adjuncts to the improved condition of the farming community, and keeping cows for their daily yield of milk is becoming a source of rapid profit. We have only to consider the question in its true light; only to profit by the example of some of our practical neighbors to reap a harvest of wealth which has heretofore gone to fill the coffers of others.

If the farmers of Missouri will learn to appreciate the numerous advantages which they enjoy in soil, climate, position and markets, over many of those who now outcrop them in material accumulation, there is no reason to doubt that the State will, in the course of a very few years, occupy the position she so much covets, at the head of her peers, in all that goes to make a commonwealth great and prosperous. The live stock interest demand attention; a systematic move in the right direction would work marvels, and if we do not profit by the lights before us, we will have no one to blame but ourselves.

TRI AS COMPA

VALUE.	NUMB		HOGS.
10,818,192	3,693	a......	Iowa.
13,061,980	3,409	......	Illinois.
8,611,161	*2,603*	......	*Missouri.*
6,844,992	2,496	k.....	Indiana.
4,123,588	2,017	......	Ohio.
4,564,625	2,008	......	Kentucky.
5,356,800	1,420	ania.	Tennessee.
2,676,150	1,147	......	Texas.
3,409,700	1,034	......	Pennsylvania.
2,704,175	753	......	Virginia.
3,185,264	618	n.....	Wisconsin.
2,068,736	510	y......	Michigan.
1,402,750	448	......	California.
731,500	484	e......	Kansas.
1,065,750	651	......	New York.
442,294	201	a......	Minnesota.
290,460	171	......	Oregon.
86,802	128	......	Nebraska.
49,500	4	......	Nevada.

AS SHOWN BY

.Wisconsin.	11..Kentu	n.	18..Nebraska.
51,941,094	$50,950,	336	$8,907,819

circle, and the steam-whistle echoes from the lonely forest shores of Terra del Fuego. The locomotive,

> "With its thund'rous vapor trailing
> Far beneath the starry vigils,"

penetrates the lonely forests and plains of our new world, and sweeps along the ancient paths of oriental commerce by the Nile and the Ganges.

[illegible] is eighth in point of area and fifth as [illegible]

ourselves.

TRANSPORTATION.

BY W. C. FLAGG,

President Illinois State Farmers' Association.

Commerce involves the two facts of change of ownership and change of place: whence we have trade and transportation. By some of our political economists, transportation is reckoned a part of production, because it adds to the cost and perhaps to the value of products, but its more natural place seems to me to be with exchange—the second grand division of political economy. Like trade, it performs a useful office between producer and consumer; but like trade also, it adds nothing to the heating power of a ton of coal, or to the feeding power of a bushel of wheat. It creates no wealth in the sense that the farmer who grows the wheat, or the miller who makes it into flour, creates wealth. It is a result of diversity of production, caused by a variety of circumstances, such as difference in climate, that enables one country to produce what another country cannot produce at all, or, at least, not profitably; such as difference of pursuits, that makes the inhabitants of Rhode Island largely a manufacturing population and the inhabitants of Mississippi an agricultural population; by differences in geological formation, that places large bodies of iron ore in Missouri and great coal fields in Illinois.

It employs, or has employed, all manner of forces to do its work. For short distances and for routes impassable for quadrupeds, the labor of men and women is employed, as in the case of the Turkish porter, the South American miner and the European peasant. Then the ox, the horse, the camel, the elephant and the llama are substituted as beasts of burden in place of the human cattle. Then vehicles are introduced that are borne along the roadways and waterways of the world by animal and natural forces. The reader of Layard's works will remember the extent to which the immense masses of Nineveh and Babylon sculpture seem to have been moved by many men dragging attached ropes. Men propelled boats by oars, and then took advantage of favorable winds by hoisting sails that carried them more rapidly, not only on sea and river, but on "carry wagons light" over Asiatic plains. The Esquimaux harnessed the dog and the reindeer; the European, the ox, horse and ass. Finally, modern civilization applied steam to the propulsion of boats and cars. The paddle of the steamer and the screw of the propeller vex the waters of the lonely fiords beyond the Arctic circle, and the steam-whistle echoes from the lonely forest shores of Terra del Fuego. The locomotive,

> "With its thund'rous vapor trailing
> Far beneath the starry vigils,"

penetrates the lonely forests and plains of our new world, and sweeps along the ancient paths of oriental commerce by the Nile and the Ganges.

The trader and transporter of the early periods were once and are still in barbaric and primitive regions. The merchant was nomadic, and carried his wares to the most promising market on his own camels or in his own ships. He sought tribes that were eager for the manufactures of more civilized nations, but who were ignorant of their value as measured by the cost of production or compared with their own wares. Heeren tells us that the Carthagenians used extraordinary efforts to prevent other trading nations from reaching the savages, with whom they could barter so profitably so long as they were kept in ignorance. They sought, and to a greater or less extent, obtained a monopoly of trade and transportation.

This spirit pervades the history of nations that are famous in commercial annals. They seek to gain exclusive control of the carrying trade; to control the supply; to limit the purchasing price; to increase the selling price. Hence, both trade and transportation have been in all ages characterized by unscrupulous crushing out of competition by extortion and inordinate gains. They have made the carrying or trading countries or cities rapidly and luxuriously rich; but to do so, have generally depleted and impoverished other lands. Tyre and Carthage, Athens and Corinth grew rich, but Western Asia and Northern Africa became wasted provinces. Chicago grows great on the products of the Northwest that pass through her warehouses, but already the farms of the Northwest begin to show exhaustion, with no compensating improvements nor increase in value. The producer has received no fair part of the value of his product, mainly from the fact that between him and the consumer the highways and often the warehouses of commerce are controlled by private greed instead of a wise and liberal public policy. For this and other reasons, we see the agricultural population, although comprising nearly as large a part of the population as in 1860, diminishing in wealth from 56 per cent. in 1860, to 37 per cent. of the total wealth of the nation in 1870. The census figures show a satisfactory rate of increase in the national wealth, but that wealth has made a few inordinately rich instead of contributing a general prosperity.

But meanwhile the free interchange of products is highly conducive, if not essential to our national prosperity. Great breadths of our territory are wanting necessaries of life that they cannot produce.

THE GREAT NORTHWEST.

We have here, in the Valley of the Mississippi, ten great agricultural States—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio and Wisconsin. They contain 600,797 square miles; 78,366,864 acres of which, or about one-fifth, was improved in 1870. They then contained a population of 12,966,930 inhabitants; only about 21½ to the square mile, but already nearly one-third of the whole population of the United States; 2,032,821 of these, or about 53 per cent. of those reported as engaged in occupations, were farmers.

As this comprises one of the most fertile portions of the globe, with a surface of level prairie upon which a larger part than usual of agricultural labor can be done by machinery, you will find that a large aggregate and part of the agricultural products of the country are found within the borders of these ten States. According to the census of 1870, they produced 67 per cent. of the wheat grown in the country; 57 per cent. of the corn; 56 per cent. of the oats; 38 per cent. of the rye; 35 per cent. of the barley, and 43 per cent. of the live stock valuation. These percentages have been increasing rather than diminishing since; and there is prospect of a great but unknown increase in the future. We cultivated, you remember, but one acre in five of our territory up to 1870.

The estimates of the Department of Agriculture for 1872 show that we produced about 60 per cent. of the wheat of the country that year, and nearly 70 per cent. of the corn. Assuming that 7 bushels of wheat per head are consumed in bread, seed and waste in the wheat-producing regions, 5 bushels in the non-wheat-producing regions, and 6 bushels in those of an intermediate character, you will find, by reference to these estimates of the Department of Agriculture, that New England was short some 16,500,000 bushels of wheat for bread. The Middle Atlantic States of New York, New Jersey, Pennsylvania and Delaware had not enough by 24,000,000 bushels; Maryland, Virginia and North Carolina, growing considerable wheat, were only 4,750,000 bushels short of a supply. South Carolina, Georgia, Florida and Alabama, had not enough by 10,500,000 bushels; Mississippi, Louisiana, Arkansas and Texas, not enough by 12,000,000 bushels. A large deficit, you notice, existed from Maine clear around our Atlantic coast to Texas. The consumption of wheat in the Southern States being in a much smaller ratio to population than in the North, would diminish the quantities required there, but the fact of non-production is as stated.

To supply this deficit, which amounts in the aggregate to nearly 68,000,000 bushels, we find a surplus of 2,750,000 bushels in Tennessee, Kentucky and West Virginia; another of 22,500,000 in the Pacific States and Territories, most of which, however, goes to Europe in vessels, and, finally and chiefly, a surplus of 65,500,000 bushels grown in the ten great States of the Upper Mississippi, of which we have been speaking.

If the consumption of corn could be estimated with the same accuracy, similar or rather analogous results would be obtained. The average production of corn in the United States in 1872 was 25 bushels for every person of our population. But, with this average, we find that while 53 bushels per capita were grown in these ten Upper Mississippi States, only 2½ bushels per capita were grown in New England; 11 in New York, Pennsylvania and Delaware; 17 in Virginia and adjoining sea-board States; 20 in the Southeastern States of Georgia, Florida, Alabama and South Carolina; 25 in Louisiana and neighboring States, and 40 in Kentucky, Tennessee and West Virginia. The Pacific and Rocky Mountain region, unfavorable to corn-culture, produced only 2½ bushels. So that, with some modifications, the same fact of a great deficit in one quarter and a great redundancy in another reappears.

The fact is a partial result of the pioneer or grain-growing system of husbandry, under which the newer regions grow grain in excess, while the older diversify their agriculture, and tend more to manufactures and other industries. But it is something more. It is the result of physical laws, whose operation is eternal. The humidity and summer heat of this northwestern region mean corn. It always will be the great home of this most important cereal; and the same remark, though in a qualified and limited sense, is applicable to wheat. The grains can be produced more cheaply, and probably always will be here than in any part of the country, except limited regions in the mountain and Pacific districts that can excel in small grains.

But these grains, or their products, in the shape of flour, meal, beef, pork, highwines, etc., to reach these consumers of the Atlantic coast must be transported not less than one thousand miles. The surplus, not a very large one, above home or American consumption, must travel the same distance to reach the seaports. To do this it has the choice of transit from Chicago through the lakes and then down the Saint Lawrence, or through the Erie canal; down the Mississippi, to which the waters of all these ten States, except those of Michigan, are more or less tributary, and up the Ohio, to cross the country by rail, or still down the Mississippi to New Orleans; or, finally, by rail along several different routes, controlled, however, by two or three leading companies.

The curious feature about these routes is, repression of their increase. Between 1860 and 1870, the population of these ten States increased over 42 per cent. The mileage of the railroads within their borders more than doubled, and the production of wheat increased in an equal ratio.

Corn did not much increase, but live stock increased 50 per cent.; hay, 75 per cent.; and other products multiplied. The year 1872 showed the immense production, according to the Department of Agriculture, of 156,228,000 bushels wheat, 693,625,000 bushels corn, 5,563,800 bushels rye, 163,479,000 bushels oats, 10,092,000 bushels barley, or 1,028,987,800 bushels of cereals.

Yet the waterways to which these local railroads (now increased at the end of 1873 to 32,829 miles) lead have not been permanently or specially improved, and through railroads to the East have not been developed with any corresponding energy. Secretary Randolph, of the Chicago Board of Trade, states that no entirely new route to the seaboard has been built from Chicago for fifteen years. And this in the face of the fact that these ten States, with but twenty-one inhabitants to the square mile, and with but little more than one acre in five in cultivation, have only just begun their work of agricultural production.

You see, now, the situation. Here are immense stores of grain and other farm products; over yonder on the seaboard are the consumers; and in like manner the peculiar products of sugar-planting Louisiana, of cotton-growing Georgia, of coal-bearing Pennsylvania, and of many other States, must go far and wide to reach the consumer. And as transportation adds nothing to the feeding power of grain, the clothing power of cotton, or the heating power of coal, although food, clothing and fuel are essential to human existence, the public welfare—the good of both producer and consumer—demands that transportation should be cheap. This is the need of the Iowa farmer, compelled to burn his corn for fuel, and of the Massachusetts mechanic, who, although temperate, industrious and frugal, cannot now support his family. The corn is worth at the station in Iowa, say 15 cents per bushel, and hence it is burned. It cannot be grown for much under $1 per bushel in Massachusetts, and cannot be bought for less than 80 cents, and hence the difficulty of obtaining cheap food for the operative. Is this wide margin between producer and consumer necessarily and rightly used in the expenses of transportation, inspection, storage and commissions? Can it be lessened, in view of its being for the great good of the masses that it should be diminished?

Beyond and above the consideration of material welfare lies the consideration adduced by Draper in his *Civil Policy of America*:

"But it is not enough that there should be free movement for thought; free movement for the people themselves is of equal importance. That is the true method of combating climatic effects—preventing communities from falling into Asiatic torpor, and contracting senseless antipathies against each other. * *

"Experience shows that travel increases as its cost diminishes. Whatever, therefore, operates as a tax on locomotion is inconsistent with the highest principles of State policy. * * In America, transportation at the lowest possible cost assumes the attitude of an affair of the highest State necessity."

Hence the problem that so many of our western farmers and merchants, and eastern merchants and consumers have been seeking to solve. The veteran, Josiah Quincy, endeavored to call popular attention to the subject as far back as 1866. Lorenzo Sherwood, of Texas, and his coadjutors, organized about the same time, or a little later, the

Anti-Monopoly Cheap-Freight Railway League, whose object was to provide government railways upon which all persons would have the right to place trains. Charles Francis Adams, Jr., began writing up the subject through the pages of the *North American Review*. The bold extortion of the Camden & Amboy Railway, of New Jersey; the despotic management of the New York Central, and the unblushing rascality of the managers of Erie, increased the popular anxiety and indignation. Railway Commissions were organized in many States. New Constitutions, such as those of Illinois and Pennsylvania, were adopted, declaring railways public highways, and subjecting them to regulation by or under law. Schemes for cheap transportation through the improvement of natural water channels, the excavation of canals, the building of railways, the regulation by State or national legislation of charges for transportation were revived or devised. A select committee of the United States Senate has made, for the time given it, an elaborate examination of the whole question of water and rail transportation, and reported thereon.

The result of these various discussions has been to improve our facilities for judging the proper cost, as compared with the charges made for transportation by rail and water routes.

PASSENGER TRANSPORTATION.

Take first the cost and charges for the transportation of passengers, as worked out from our present practice of permitting common carriers to charge what they can and will, through the privileges extended to them by special legislation and other favors. The exact cost of transporting passengers has been less precisely ascertained than that of carrying freight, but still we can approximate to the amount that would cover the expense. Under this head we need only consider railway transportation, as practically the railroads now take nearly all the travel where they run. We have the statement of the Pennsylvania Company that in 1872 it costs 1.837 cents to carry a passenger one mile. Examining the reports of the State Engineer of New York, I find that assuming the cost of maintenance of roadway, (including taxes,) cost of repairs and machinery, and cost of operating the roads to be the items of cost, that the average cost to the roads of New York for conveying a passenger one mile was 1.645 cents in 1872, and a trifle less than 1.64 cents in 1873.

Comparing these figures with the more attainable statistics of *charges* made for the transportation of passengers, we find that a tabulation of them gives something like the following:

Pennsylvania Company	1872	2.45	cents.
Massachusetts Roads	1872	2.426	“
“ “	1873	2.49	“
New York Roads	1872	2.3801	“
“ “	1873	2.3566	“
Ohio Roads	1872	3.18	“
Illinois Roads	1873	3.75 ?	“
“ “	1874	3.33	through.
“ “	1874	3.86	way.

These are the averages of large and populous States through which the current of travel flows constantly and full, and which consequently give the most favorable conditions for cheap transportation were that sought by their railway carriers.

Comparing costs with charges, we see that the Pennsylvania Company demands of those that travel on its roads, thirty-three and a third per cent. advance on the cost. The New York roads demand forty-five per cent. advance on cost.

As illustrating the excesses and lack of uniformity in passenger transportation charges, the following list of *agreed* rates, from St. Louis, for January, 1875, may suffice:

Distances exceeding 2,000 miles.

Sacramento	2,322 miles	$116 00	or 5 cents a mile.
San Francisco	2,460 "	116 00	or 4.7 " "

Distances between 1,000 and 2,000 miles.

Salt Lake	1,615 miles	$95 50	or 5.9 cents a mile.
Quebec	1,304 "	33 65	or 2.6 " "
Boston	1,294 "	31 00	or 2.4 " "
New York	1,100 "	27 00	or 2.5 " "
Lynchburg, Va	1,130 "	30 50	or 2.7 " "

Distances between 500 and 1,000 miles.

Cheyenne	965 miles	$47 00	or 4.9 cents a mile.
Denver	920 "	51 00	or 5.5 " "
St. Paul	802? "	20 00	or 2.5 " "
New Orleans	725 "	27 00	or 3.7 " "
Knoxville	797 "	25 10	or 3.1 " "
Atlanta	662 "	27 50	or 4.1 " "
Buffalo	701 "	21 45	or 3.0 " "

Distances under 500 miles.

Atchison	330 miles	$12 00	or 3.9 cents a mile.
Fort Scott	300 "	14 00	or 4.6 " "
Quincy, Ills	180 "	6 15	or 3.4 " "
Chicago	280 "	9 00	or 3.2 " "
Cincinnati	340 "	10 00	or 3.0 " "
Cairo	148 "	6 00	or 4.0 " "
Memphis	349 "	14 50	or 4.0 " "

An examination of these figures shows that the government aid given to private companies in the case of the Union and Central Pacific railways, has not given cheap rates to the public, but that a full monopoly and extortionate charges are the result; that the rates are not, apparently, affected by steamboat competition to river towns, and that competition of railway with railway, does not have any marked effect. Combination rather than competition, seems to fix the rates.

Compare these with what experience has shown to be possibilities of practice in European countries.

Here is a table from the *London Quarterly Review* for April, 1873, giving the "Average fares charged to first-class passengers for a journey of 100 miles, in the twelve countries of Europe enumerated below." I reduce the amounts to cents per mile, in coin—24 cents to a shilling:

	s.	*d.*		CENTS.
Belgium	6	6	per 100 miles	1.56 per mile.
Italy	10	6	"	2.52 "
Spain	11	9	"	2.82 "

Prussia Denmark Austria	13	—	"	3.12	"
France	13	4	"	3.20	"
Norway	13	4	"	3.20	"
Switzerland	13	6	"	3.24	"
Holland	14	—	"	3.36	"
Portugal	14	2	"	3.40	"
Russia	14	5	"	3.46	"
United Kingdom	18	9	"	4.50	"

The significant figures of this table are the first and last. Belgium and Great Britain, representing the lowest and highest rates, are both densely populated, and travel by rail in them is unlimited. In England it was ascertained in one case, by actual experiment, that passengers could be carried at .42 of a cent per mile, in first-class carriages, with a loss of one-half of one per cent. in the dividends on the stock; and in another case, at .54 of a cent per mile, without any loss whatever. But practically, in England as in the United States, the charges have been left to the corporations that operate the roads; and the result has been, as above seen, that no country in Europe shows such extortionate rates. Belgium has pursued exactly the opposite course. "For the purpose of cheapening transportation, and controlling and preventing the rapacity of chartered railway companies," says Mr. Medill, in the *Chicago Tribune* of August 8, 1874, "the Belgian government constructed several canals from the coal and iron districts to the navigable waters of the Schelde, and connecting with the great French canal along the Oise river, which leads down to Paris from the Belgian frontier. The government also entered upon the construction and operation of a system of net work of state railways, with the primary purpose of conveying freights and passengers at the lowest self-sustaining rate of compensation. Belgium was the first government in the world that ever built and managed a railway for general public accommodation. The state now owns, or has leased from the companies, 1,083 miles of railway, mostly double-track, and all with steel rails. The companies own and operate about 890 miles; but the government is constantly obtaining control of company roads by leasing them. By a provision in their charters all the company built roads lapse gratuitously and become the property of the State at the end of ninety years; and as some of them were constructed as long ago as 1835, nearly half of the period of their charters has already expired, when they will become the property of the State.

"The Government built its railroads from the proceeds of the sale of bonds—the earliest issues being 4½ per cents and the latter 4 per cents. The tariffs charged for freight and passengers are calculated at such rates as will produce the largest possible business, and at the same time pay interest on the bonds, and operating expenses, the repair of tracks and rolling stock, and leave a small sinking fund surplus. It is found by experince that these ends can be effected by charging about *one-half* the rates exacted by the French, German, Italian, Austrian and British company railways. As nearly as I am able to ascertain, the Belgian State railway's charge rather less than *half* the rates imposed by Illinois and other Western State railway companies. Passenger fares averaging for different distances, may be stated at 2½ cents per mile for first class passengers, 1½ for second class and ¾ cent for third class. The second class cars of Belgium are as comfortable as the ordinary American first-class and differ from the Belgian first class mainly in being less [more ?] crowded; only the nobility of England and Russia and the Shoddy of America deny tickets in the latter."

These figures will give some conception of the systematic overcharging by railways not controlled in some way in the public interest. In 1873 Mr. Poor tells us that $139 748,534 were received for passenger fares on the railways of the United States. Fifty or sixty millions were taken from the traveling public for which no equivalent was given, in a country where, as we have already noticed, it is public policy to encourage an intermingling and movement of the inhabitants.

CHARGES AND COST OF TRANSPORTING FREIGHT.

But the railway charges for freight during 1873, amounted to the far greater sum of $387.542,789. The freight business is nearly three times as great in amount as the passenger. The value of the commodities moved by the railways in 1872 is estimated by Senator Windom at $10,000,000,000, although during the entire season of navigation of the same year, "an average of one vessel every nine minutes, day and night, passed Fort Gratiot light-house, near Port Huron. The aggregate, therefore, of any excess in freight charges, by rail or water, amounts to an immense sum, and is in the main an indirect tax on the producers and consumers of the nation, ninety per cent. of whom belong to the agricultural, mechanical and other manual labor classes.

Examining into the cost of railway transportation, we find little agreement, even on the part of experts. The returns of 10 New York roads for 1873, give it as high as 1.74 cents per ton per mile. L. P. Morehouse, assistant engineer of the Illinois Central, makes it 1.58 cents on that road. Mr. Newell, its president, estimated the cost at 1.4 cents when before the Senate Committee on Transportation. Mr. Walker, of the Chicago, Burlington and Quincy road, placed the cost on his road at 1.3 cents. Mr. Hayes, general agent of the Blue Line fast freight, affirms that 1 cent per ton per mile is about the lowest amount for which railroads can afford to take freight from Chicago to New York under the present system. Mr. Frost, the general manager of the great Jackson route makes the same statement in reference to Southern roads. The Pennsylvania Company in 1872, carried at a cost of .886 of a cent per ton per mile. The Syracuse, Binghampton and New York road carried freight for twelve years, ending with 1873, at an average cost of 9 mills. In 1873, according to the New York reports, the Lake Shore road carried at a cost of .97 of a cent. The Erie at .93 and the Syracuse Binghampton and New York at .68. The actual cost of carrying coal on the Providence and Worcester road, say the Massachusetts Railway Commissioners, is 6 mills per ton per mile. The Syracuse, Binghampton and New York road just mentioned, carried freight in 1862 at a cost of .41 of a cent, which is the lowest of any American railroad rates that I have examined; though in England coal has been carried at .32 of a cent per ton per mile.

In fairness, it must be said that these calculations of cost are made from different data, and can hardly be reduced to one standard; but they will answer the purpose of showing the wide margin between necessary costs and what the public are required to pay.

The lowest *charges*, for any considerable period, of which I have any record, are those of Belgium, where for a haul of 155 miles .74 of a cent per ton per mile are charged. The Syracuse, Binghampton & New York, for 1873, charged 1.12. The through rates from Chicago to New York are said to average 1.21 cents. The Pennsylvania Company averaged, in 1872, 1.4193 cents; the Syracuse, Binghampton & New York, for a period of twelve years, ending with 1874, 1.46. The whole system of New

York railways, in 1878, charged 1.5909 cents. In France the charge for hauls of 186 miles is 1.74. The Illinois through routes, for 1874, charged 2 04 cents; the Massachusetts roads, for 1873, 2.18, and the Ohio roads, for 1872, 2.55. The Illinois local rates, for 1874, were 3.39 (against 4.72 in 1873), and the Great Britain rate, for a distance of 155 miles, is put at 4 cents per ton per mile.

The following table enables us to form some idea of the profits secured by the roads carrying at the lowest rates:

RAILROADS.	*Per Ton per Mile.*	
	Charge.	Cost.
Syracuse, Binghampton & New York, 1873	1.12	.68
Chichago & New York, through	1.21	1.00
Pennsylvania Company, 1872	1.4163	.886
Syracuse, Binghampton & New York, 12 years	1 46	.9
New York roads, 1873	1.5997	.994

Here is an average advance of 58 per cent. on the amount of cost charged to the public on the cheapest roads. What it may be on the roads charging from two to four cents per ton per mile may be conjectured, but not definitely fixed. It is evident, however, that transportation, instead of being forced down to as near cost as possible, is used to inordinately tax the producer or consumer, or both. This is the natural result of placing the highways of commerce in the hands of what is called "private enterprise. 200,000,000,000 bushels of grain, according to the Senate Committee's Report, vast amounts of animals and animal products, and grain products, seek an outlet from these northwestern regions a thousand miles to the seaboard. It cost the producer or consumer, according to Mr. Windom's report, 35½ cents for each bushel of wheat sent from Chicago to New York City by rail in 1872, and 31.7 cents by water. It cost the consumer 17.2 to send a bushel from St. Louis to New Orleans by water. It cost him 51.7 to get a bushel of wheat from Chicago, *via* New York, to Liverpool, and 47.3 from St. Louis to Liverpool by way of New Orleans. This supposes the producer to be situated at one of these two great commercial points of the Northwest. As a matter of fact, few are thus fovorably located, and nearly all must pay heavily to reach those points.

"The cost (to producer) of transporting wheat from points west of Chicago on the Mississippi river to Chicago, averages about 17 cents per bushel, and the cost of transporting corn about 15.9 cents."

West of the Mississippi river, of course, the charges grew worse. Mr. Hubbard, in his paper before the American Social Science Association, in 1874, was no doubt within bounds when he said that "the average freight charges for wheat from the Mississippi Valley to New York, in the summer of 1872, were 50½ cents per bushel (all rail), and 43 6-10 cents by rail and water."

Supposing this vast quantity of 200,000,000 bushels of grain to have been wheat, carried on the Belgian principle of a minimum of cost for the average of 1,200 miles, at .74 of a cent per ton per mile, and its transportation would have cost by all rail 27 cents per bushel, and by water proportionally less, with a saving of 23 or 24 cents per bushel, amounting on the crop of 1872 alone to nearly or quite $50,000,000. In a year of immense production and low prices, this enormous tax was levied on the producers of these ten Northwestern States. In years of short production and high prices, it is levied more on the consumer. If, as some affirm, freight roads and more economical management can reduce the actual charge for railway hauling to 12, 10 and 8 cents per bushel, the burden is correspondingly lifted from the producer and consumer.

But it is always to be remembered that in the case of exported articles like wheat and corn, the producer is placed at the mercy of foreign markets. Senator Windom states that about 8½ per cent. of our cereals were exported in 1870. In 1872, about 7 per cent. of the product of the ten Northwestern States went abroad. But this amount, small relatively as it was, was fixed to a considerable extent the price of that sold at home; and whether we would or not, we were compelled to sell our grain against a foreign market. "The price of the whole crop," says Carey in his *Social Science*, "is dependent upon that which can be obtained for the little surplus that *must* go abroad, or paid for the small quantity that *must* be brought from a distance."

WATER TRANSPORTATION FOR FREIGHTS

Has been looked to by some as a permanent and cheap means of transportation that cannot be made to do the work of monopolies. The *possibilities* of water transportation are certainly dazzling. We of the Northwest, with the chain of great lakes that touch six of our ten grain-growing States—Ohio, Indiana, Michigan, Illinois, Wisconsin, Minnesota; with the great rivers Mississippi and Missouri, running by or through seven of them—Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas and Nebraska; with the smaller rivers of the Ohio, Wabash, Illinois, Wisconsin, etc., and the possibilities of short and speedy cut-offs between the rivers and lakes, and rivers and ocean, may naturally look to water transportation for relief.

Certain facts, however, must be faced in this consideration:

1. All the rivers named within these ten Northwestern States, and any canals that may be or are constructed in them, must be closed by ice or scant water a certain part of the year. The average length of the season of navigation on the Illinois and Michigan canal, from 1848, to 1873 inclusive, has been 240 7-26 days, or about two-thirds of the year. The Sault Ste Marie canal, between Lakes Superior and Huron, from 1858 to 1872, inclusive, was open 210½ days on the average, or about 7 months of the year. Navigation from St. Louis southward, from 1859 to 1872, inclusive, was suspended by ice or low water nearly 18 days in the year, leaving 346 11-14 navigable. It is safe to say that the waterways of this region are practically closed, on the average, three months in the year, so that for one-quarter of the time the transportation is left in the hands of the railway corporations.

2. However efficient for through transportation of coarse cheap products, consumed immediately on the line of transportation, waterways are limited in their application to this. The shipper of flour, even from St. Louis, to a New England inland town direct, finds no advantage in water transportation. The breaking bulk, the insurance, and the slowness of transit overcome the advantage of lower rates per ton per mile. Could waterways, natural and artificial, be as ramified as the railway system of the country already is, those objections might be removed in a great part; but the great cost of efficient canals in the first place, and the impossibility of constructing them in many regions forbid this supposition.

3. Although it is asserted that competition will have free play upon lakes, rivers and canals, this is not entirely true. The testimony before the Senate Committee elicited the fact that at least five of the transportation companies running steamers, propellers, etc., on the great lakes are running in connection with, and are more or less controlled by, railway companies. *The Erie canal had no such connections.* It also appeared by this testimony, that a combination of companies controlled the freight business of the Upper Mississippi, and a similar combination the towing of sea vessels into and out of the Mississippi river below New Orleans. Elevators and other transfer companies are more or less conspired against public interest where not prevented by law. The Erie canal, the Illinois and Michigan canal, and other routes in control of the public authorities, are almost the only thoroughfares upon which private conspiracy or corporate privilege has not assumed a more or less effective control.

But water transportation *may be* cheap. Mr. McAlpine, in an address before the Chamber of Commerce of New York, gives the following figures of comparison between cost of water and railway transportation, calculated on the rate per ton per mile:

Ocean, 300 miles and more	1 mill.
" short voyage	2-4 "
Interior Lakes 1000 miles	2 "
" " short voyages	3-4 "
Mississippi river	3 "
Erie canal, enlarged	4 "
Shorter canals	5-6 "
Coal railroads	6-10 "
Railroads generally	12½ "

"The charges for grain, etc., by sail on the lakes in 1873," adds Mr. McAlpine, "were 5 mills per ton per mile, and by steam, 6 mills, and by Erie canal, 6 mills. At the same time the charges by railway from Chicago to New York were 10 mills in the Summer and 14 in the Winter."

In July, 1874, according to the *Buffalo Commercial Advertiser*, the lowest rates from Chicago to New York by Lake and canal ever known were reached, a bushel of wheat being carried for 12½ cents and a bushel of corn for 11¼. Taking the all rail route as the practical distance carried, this is .42 of a cent per ton per mile—not yet reaching the lowest recorded railroad rates. Taking the actual distance (1,411 miles) it is a trifle less than 3 mills per ton per mile. This may be in part the result of the steam navigation on the Erie canal, which now promises to considerably reduce the cost of canal transportation.

Mr. Haarstick, of the Mississippi Valley Transportation Company, stated before the Senate Committee at St. Louis, that with plenty of business and a good stage of water, he could take freight from St. Louis to New Orleans at $3 per ton. This is a little over 4 mills per ton per mile for the railroad distance, and about 2½ by the route followed. A "coal tow," under favorable conditions, has been known, it is said, to carry freight down the Ohio and Mississippi at 1 mill per ton per mile.

CONCENTRATED PRODUCTS PREFERABLE.

For the purposes of exportation, or massing for distribution from great commercial centers, there is no doubt of the desirableness of water transit. Whether the public welfare is subserved by either process is more questionable. The direct shipment of flour to New England towns by our St. Louis merchants over railways is no doubt a better system for producer and consumer than sending our unground wheat to New York city by water, to be sent thence into New England. The export of grain in bulk, though perhaps a necessity of our pioneer farming, and the absence of capital in the new regions of the northwest, cannot be too strongly deprecated as a prodigal waste of the fertility of our soil.

Our western policy should be, so far as possible, to avoid concentration of shipment and the sending of the raw material of farm, forest or mine production. We want not one, but several seaports for exportation. We should communicate directly with Montreal, Boston, New York, Philadelphia, Baltimore, Port Royal and New Orleans. We should send flour and not wheat, cattle rather than corn, mess pork rather than live hogs.

But, in any event, we want cheap transportation, and the problem is how to effect it for all parts of the country by the least expensive attainable means. The facts we have cited show the already developed *possibilities* of transportation; but also show that as a matter of fact the highways of our commerce are controlled by private, and often illiberal interests, under whose influence the masses of the people are impoverished. Whether we deem water or railway communication, or both, most desirable, we must look to something more than private competition as a regulator. I shall perhaps offend, but I ask to be heard when I say that a

SERIOUS ERROR IN OUR MODERN POLITICAL ECONOMY

Is committed in an unqualified acceptance of the *Laissez Faire* doctrine. It is but another statement of the older teaching of "Every man for himself and the Devil take the hindmost." It is a race in which corporate and other combinations of capital controlled by unscrupulous men are the winners, and isolated and honest industry falls in the rear. The more free the conditions the worse the evil. It is in Great Britain, the freest of monarchies, and in America, the most advanced of republics, that corporate capital and legalized privilege have worked most unrestrained and done most harm to the industrial classes. This, I take it, is from the lack of a well adjusted system of government. Personal liberties have been imperfectly guarded against the undemocratic powers and privileges conferred upon the railway corporation, the protected manufacturer and the national banker; and the consequences, already terrible, are difficult to predict. Under the Dartmouth College case, the so-called "vested rights" of artificial persons are made, as the *American Law Review* asserts, "more sacred than those of natural persons." "It [the Dartmouth College decision] frequently stands in the way of what all would admit would be beneficent legislation, and places many corporations monopolizing enormous privileges and wielding enormous influence—influence so great as often to shape legislation and central political action—entirely beyond governmental control. So long as they keep within the limits of vague and loosely worded acts of incorporation, originally drawn up by themselves. * * * To these great associations, often so powerful as to constitute *quasi* sovereignties, the decision in the Dartmouth College case has been indeed not a *magna* but a *major charta*, for it has conferred upon them an independence such as the East India Company, in its palmiest days, never possessed, or even aspired to."

Fifteen years ago the venerable Henry C. Carey pointed out the danger, concluding with the expressive words: "Of all governments the most exhausting and oppressive is that of the transporter." The *Westminster Review* for January, 1871, declares that the "United States is rapidly entering a new feudal age, in which industry pays its tribute to commerce, as in former times it did to the sword. The despotism of this feudalism is as certain as the other, though the means for enforcing it are more subtle and complex—partaking in this respect of the change in the application of force which has marked the advance of industry itself. Industry does not depend on mere muscular energy, but upon steam; nor does despotism depend upon the sword for maintaining its rule, but upon legislation, upon financial methods; though in both cases the chief hold upon the people is founded upon the possession of the roads."

George P. Marsh, our present Minister to Italy, said, more than ten years ago:

"I shall harm no honest man by endeavoring, as I have often done elsewhere, to excite the attention of thinking and conscientious men to the dangers which threaten the great moral and even political interests of Christendom, from the unscrupulousness of the private associations that now control the monetary affairs, and regulate the transit of persons and property in almost every civilized country. More than one American State is literally governed by unprincipled corporations, which not only defy the legislative power, but have, too often, corrupted even the administration of justice. Similar evils have become almost equally rife in England and on the Continent: and I believe the decay of commercial morality, and I fear the sense of all higher obligations than those of a pecuniary nature, on both sides of the Atlantic, is to be ascribed more to the influences of joint-stock banks and manufacturing and railway companies—to the workings, in short, of what is called the principle of associate action—than to any other one cause of demoralization.

"The apothegm, 'the world is governed too much,' though unhappily too truly spoken of many countries—and perhaps, in some respects, true of all—has done much mischief whenever it has been too unconditionally accepted as a political maxim. The popular apprehension of being over-governed, and, I am afraid, more emphatically, the fear of being over-taxed, has had much to do with the general abandonment of certain governmental duties by the ruling powers of most modern States. It is theoretically the duty of government to provide all those public facilities of inter-communication and commerce, which are essential to the prosperity of civilized commonwealths, but which individual means are inadequate to furnish, and for the due administration of which individual guarantees are insufficient. Hence, public roads, canals, railroads, postal communications, the circulating medium of exchange, whether metalic or representative, armies, navies—being all matters in which the nation at large has a vastly deeper interest than any private association can have, ought legitimately to be constructed and provided only by that which is the visible personification and embodiment of the nation, namely, its legislative head. No doubt the organization and management of these institutions by government are liable, as are all things human, to great abuses. The multiplication of public placeholders, which they imply, is a serious evil. But the corruption thus engendered, foul as it is, does not strike so deep as the rottenness of private corporations; and official rank, position and duty have in practice, proved better securities for fidelity and pecuniary integrity in the conduct of the interests in question, than the suretyships of private corporate agents, whose bonds men so often fail or abscond before their principal is detected.

"Many theoretical statesmen have thought that voluntary associations for strictly pecuniary and industrial purposes, and for the construction and control of public works, might furnish, in democratic countries, a compensation for the small and doubtful advantages, and at the same time secure an exemption from the great and certain evils of aristocratic institutions. The example of the American States shows that private corporations—whose rule of action is the interest of the association, not the conscience of the individual—though composed of ultra-democratic elements, may become most dangerous enemies to national liberty, to the moral interests of the commonwealth, to the purity of legislation and of judicial action, and to the sacredness of private rights."

The inconsistencies of American statesmanship—if it can be called by that name—in this respect, are curious. The National Government has from the beginning, or nearly so, issued the coin of the nation, but has permitted private persons, under State authority, and with great aggregate loss to holders, to issue bank notes. It has controlled and operated the post-offices and carrying of mails, including letters and nearly all kinds of packages under a given weight, but made no effort to control or operate the closely-allied and important functions of the express and telegraph. It has passed laws aiding, regulating and controlling the ocean, lake and river commerce of the country, but has barely touched the equally important question of railway transportation, except to subsidize and donate public property to private persons. The State governments have, in most instances, shown themselves just as incapable, blind, and lacking in a clear conception and purpose. New York carried out one of the finest conceptions of American statesmanship in herself building and permanently holding the Erie canal; but what shall we say of a policy that has rendered possible a Vanderbilt, a Gould and a Fisk? Illinois built and holds the Illinois and Michigan canal—a perpetual check on competing railways; but the same State permitted her counties, towns and cities to be taxed to depletion for private profit, under the plausible guise of encouraging railway construction, with no adequate protection of the interests of the people.

FRATERNALISM.

Nearly a year ago (April, 1874) Switzerland, the oldest republic of the world, and one that of late has looked to the United States for authorities, precedents and warnings, adopted a new Constitution. "It has now become," says Mr. Medill, "a federal government of sovereign power over all such subjects as peace and war; army; national defense; patent laws; coinage; postal and telegraphic communication; public instruction; regulation of railway fares, freights and time-tables; imposts and excises; right of way for new railways, and several other subjects of general concern. The new Constitution of Switzerland, deliberately adopted after full discussion and reflection, and the experience of the old one for twenty-five years, creates a national or central government, with larger relative powers than those conferred on the government of the United States by the American Constitution, which instrument the Swiss have profoundly studied and made their model, but improved upon it, as they think, in several important respects."

The point in this quotation, to which I would call special attention, is the fact that a republic has recongized the necessity of taking public change of general transportation to prevent its use as a means of extortion on the part of private companies.

Mr. Galt tells us that as long ago as 1834, Rogier, the Belgian Minister of Finance, resisted the idea that railroad regulations could be left to competition. "The state of affairs in which competition corrects the evil," he said, "does not apply here. Whoever holds the railroads holds a monopoly, and that should only be allowed to exist in the possession of the State, subject to the responsible advisors of the crown."

Subsequent experience in England and the United States has confirmed this conviction. John Stuart Mill, in his *Political Economy*, places railway associations among those that should be controlled by government, because, though competition be allowed, none ever really takes place. Charles Francis Adams, Jr., and others in our own country, give testimony to the same effect; and those of us who have had the fortune to depend upon one line of railway for transportation, will hardly ask for authority or argument on the subject. Personal experience insures conviction. We will all indorse the views of Mr. Edward Williams, expressed in the Department of Economy and Trade of the British National Association for the promotion of Social Science, in 1870. "They in Middlesburgh felt that railways, being in effect the highways of the country, made under monopolies created by the government, all subjects had an absolute right to travel over them by paying the cost of the service rendered to them. They felt that railways, being so closely connected with the welfare and interests of the public, could not come within the sphere of private speculation, and the people had as much right to travel over them as they had to go over the old highways, the canals or the rivers."

England, a country that is sharing fully the American prejudice against government intervention, has given the corporation system a very thorough trial. Mr. Galt tells us that the evidence elicited before the Parliamentary Committee of 1872, proved, among other things, the following facts:

First—Excessive rates compared with the cost of conveyance.

Second—Exorbitant rates imposed upon some towns in comparison with others.

Third—The failure in promoting competition by giving running powers over lines having separate or antagonistic interests.

Fourth—A powerful railway interest in Parliament itself, represented by 124 directors in the House of Commons and 62 in the House of Lords; and

Fifth—The question suggested "Whether the progress of combination between railways may not lead, at some future time, to the creation of corporations, so few, so large and so powerful as to render it expedient on political, if not on commercial grounds, that a fundamental change should take place in the present relations between the railways and the State?"

The state of things so contemplated may "possibly arise, and so far as the evidence offered to the Committee has touched upon the subject, the only remedy suggested for it is the acquisition of the railways by the government."

Frederick Hill, in a paper read before the British National Association for the Advancement of Social Science, in 1870, says: "In truth, instead of the State preventing competition, it is, so far as I am aware, the only means by which this advantage can be secured; for while there can be no durable competion so long as the railways are private prôperty, the State, if once their owner, by letting them out for working, will easily create a competition both continuous and effective. And thus what is often brought forward as a reason against State ownership tells forcibly the other way." For local roads, I may add, Mr. Hill advocates the plan submitted by his brother, Sir Rowland Hill, author of the cheap postage system, and one of the late Royal Commissioners on Highways. You will notice how closely this plan carries out the idea that railways are to be the future local as well as principal highways of the country.

"*First*—Railroad by-ways to be made with very narrow gauges, like that laid down by Mr. Harrison, between Thirck and Mahon, the cost of which was only £1,000 per mile, or including rolling stock, say £5,000, equal, at 5 per cent. interest, to £250 a year.

[These figures, I may add, are much above the cost of our American narrow gauge railways. The Denver & Rio Grande Railroad, 3 feet gauge, 80 miles long, cost not to exceed $13,500 per mile. The Toronto & Nipissing Railroad, with 3 feet 6 inches gauge, 82 miles built, cost in cash per mile, without rolling stock, $12,549, and inclusive of rolling stock, $15,724 per mile. This includes $700 for fencing per mile.]

"*Second*—On the principle acted on for ages in this country in cases of ordinary by-ways, and now adopted in France with regard to railroad by-ways, this cost to be paid for by the owners of the land through which such railways would pass, and whose property would be benefitted, to a distance from them, say of four miles; an arrangement under which the annual rate would be only a shilling an acre.

[" In 1865, the (French) system was further modified by the introduction of a new principle, under which the deparments and towns were empowered themselves to undertake, or to authorize others to undertake, the construction of local roads within their jurisdiction. Through the ultimate consolidation of these local lines within the districts apportioned to the great companies, this principle may lead, by the introduction of competition, to important modifications of the whole existing railroad system of France. As yet, however, only some 150 miles of such local roads have been constructed, though the tendency towards their increased construction is very decided."—Report Mass. R. R. Com., 1873.]

" *Third*—The question whether any particular railroad by-ways shall be made, to be determined by a majority of the land owners in the district.

" *Fourth*—The government to be empowered to lend money on the security of the rates, for the construction of railroad by-ways, and the land owners to be at liberty, at any time, to transfer to the government the ownership of these railways."

Thus you see the drift of the older and more experienced countries of Europe is to the State ownership, or at least of the public ownership of railways. These views are modified according to their political forms and idiosyncrasies of national characters; but everywhere the conviction appears that to do public service the railways must be made public highways. In England, against the ingrained prejudice and patriotic jealousy of the people, the conviction has forced itself gradually upon the public mind, until the time seems not far distant when an entire revolution in the railway system of Great Britain will take place.

Take Prussia, a country in which there has already been a considerable exercise of governmental power over railways. Here is an extract from the report of a Committee to its Legislature:

"The first question we proposed to ourselves was, whether the construction of railroads ought to be exclusively the business of the State, or whether it ought also to be opened to public enterprise. The Commission has never been doubtful as to what reply should be addressed to this question, and all experts on the subject agree that for the present the exclusive control of the railroads cannot practically be entrusted to the State. At the same time, the Commission has never been able to escape the conviction that the railroad business—considering the extension it has received in these days, and what is to be expected for it from the future—must ultimately lead to the possession of all railroads by the State. Railroads are public modes of transportation, and are therefore in the nature of public highways. It is only by compulsory reasons that the construction and running of railroads have been taken out of the hands of the State and allowed to be controlled by private corporations. Nevertheless this state of things cannot continue, * * and hence the Commission considers it desirable that the State government should always keep in mind the possibility of obtaining their control, and take such steps as will facilitate its realization." This you will remember is in a country where " Government has the possession and management of the principal railways, but concessions are granted to corporations."—Wm. Galt, *Fortnightly Review*, November 1873.

Even there it seems conceded that additional ownership by the State is demanded, although first class passenger rates are only $3 per 100 miles, against $4.40 in Ireland, and only 76 cents per 100 for the lowest class against $1.96 in Ireland. "You see the German women coming in with their large baskets of vegetables or fruit, at the distance of ten or fifteen miles into a market town at a cost of ¼ of a cent per mile, and they make their marketing before 12 o'clock in the day, and go away in crowds."

How gladly would the masses of the population of the United States welcome a cheapness of railway transit with which Germany is not content.

M. Farsseaux, Director-General of the Belgium railways, said, according to the Report of the Joint Committee of Parliament: "The interests of the country demand that the State should be master of the railways, and should itself work the chief lines, leaving to the companies the branches or feeders. (I should prefer to leave these to the local public authorities.) *Under these conditions I am convinced that the system of railways of the most extensive country may be administered as easily as any other public service.*" This is the testimony of an expert who knows whereof he affirms. He goes on to describe the organization: "All persons employed on railways are precisely on the same footing as regards their position in reference to their salaries and pensions as other persons in the civil service. The appointments are made on the competition system. Notice is given in the *Moniteur* when appointments are to be made, and a syllabus is issued of the knowledge required by the candidates, who are examined before a committee, and they receive their appointments according to their success in the examination. There is a Director-General and three principal divisions, each having a separate head—the Locomotive, the Permanent Way and Works and the Traffic Departments, and there are two additional divisions—one for the accountant and the other for stores and general matters."

All this, which is simply the drift of European and American thinking, after experience, leads up to a manifest but heretofore much ignored conclusion.

RAILWAYS ARE THE HIGHWAYS OF OUR MODERN CIVILIZATION.

For long hauls they virtually abolish the ordinary earth roads, and leave them to be used only for local purposes. They draw heavily upon the transportation of canals and rivers, and in consideration of their safety, quickness and continuity of transit, are able now and will be more so in the future, to rival water routes for nearly every kind of transportation. Yet the fact that in the nature of the case they are and must be highways seems to have been held to and insisted upon by only a few. The old Duke of Wellington said in Parliament, in effect: (*New Englander*, October, 1871,) "My Lords, this is the beginning of a great change, and we must take care that we do not lose the old English idea of the King's highway." William Galt, when before the Parliamentary Committee of 1844, took the ground "that the railways had now become the high-roads of the country." (*Fortnightly Review*, November, 1873.) A late committee of the Prussian Legislature has just been reported as saying that "Railroads are public modes of transportation, and are, therefore, in the nature of public highways." (*Missouri Democrat*, December, 1873.) Our new Constitution of Illinois, in 1870, and that of Pennsylvania, just adopted, make the declaration that railways are public highways. Senator Carpenter, of Wisconsin, advocated the same idea several years since, and in a late address at Rockford, Illinois, stated that the Supreme Court of the United States, and thirty-five out of thirty-seven State Supreme Courts, had maintained the same doctrine. But for a period of twenty-five or thirty years, this doctrine, if not lost sight of, was practically ignored in many parts of the United States. Legislatures permitted, railroad companies assumed, and courts decided that in effect a railway corporation was a private corporation, the only limit to whose powers was its inability to buy or wheedle its way through legislative chambers: in other words, that a railway charter was an irrevocable contract with a private company, by which these highways of our modern commerce and travel were handed over to private citizens to use as they would, subject only to the ordinary duties of a common carrier, who can charge what he will, and do as little as he will, without practical responsibility.

But what is a public highway? It is defined by Bouvier as "a passage, road or street, which every citizen has a right to use." Now, "every government," says Cooley in his *Constitutional Limitations*, p. 533, "makes provision for the public ways, and for this purpose it may seize and appropriate lands. And as the want of traffic and travel require facilities beyond those afforded by the common highway, over which every one may pass with his own vehicles, the government may establish the higher grades of highways, upon which some of its own vehicles alone shall run, whilst others shall be kept open for use by all on the payment of toll. The common highway is kept in repair by the assessments of labor and money; the tolls paid turnpikes, or the fares on railways, are the equivalents to these assessments, and the latter are equally public highways with the others, when open for use to the public impartially." The railway as now constructed, that is, is of the nature of a turnpike road, which is "a road or highway over which the public have the right to travel upon payment of toll."

IF RAILWAYS ARE PUBLIC HIGHWAYS

—are practically monopolies—we can come to but one conclusion. The monopoly, so far as it exists in the hands of corporations claiming to be private, must be crushed out. The turnpike roads, which our railroads virtually are, must have their tolls regulated directly or indirectly by the authorities of the territory in which they exist, like the tolls on other turnpike roads. The monopoly in the future should be held by these same authorities in more careful keeping. The township, the city, the county, the State and the Nation, all build roads and streets. Why should the laying down of two rails, and putting or permitting a certain form of vehicle upon them, be so disastrous to the public welfare, compared with the manipulations of the Credit Mobilier and the doings of Erie?

Pomeroy, in his *Constitutional Law* (p 102), says: "We have the ascending scale of towns, counties, States and Nation. Villages and cities are modifications of towns created under special acts of incorporation, rather than by the general laws of the commonwealth. In each of these four grades, rights, powers and capacities are exercised, which are limited by the territory and the peculiar local needs of the particular class. The people of a town meet to discuss and settle certain matters which relate solely to their own small vicinage. The people of a county choose a legislative body which manages the concern of that community, consisting of several towns. The people of a State delegate their powers to a government whose jurisdiction extends through the limits of that commonwealth, and includes all subjects of legislation which affects the citizen in his personal and private relations; which define his rights of security and prosperity, and the obligations he incurs by virtue of his being a local inhabitant, or by virtue of his acts towards others. Finally, the people of the United States delegate a portion of their powers to rulers, who may legislate for them in respect to all matters which peculiarly concern them as a Nation."

LET EACH REGION MANAGE ITS OWN AFFAIRS IN ITS OWN WAY.

I think there are few Americans who will not accept of this as the most fitting and politic distribution of the powers of government in the United States. I propose now that we follow its application, under existing practice in many, and I presume a majority of the States, the local roads of the township. and the streets of the village or city are established and constructed by the local authorities. In a few instances corporate companies are permitted to build roads and charge tolls, but the regulation of those tolls remains with the public authority. But as soon as ties and rails were laid down, and a peculiar vehicle required to be run on these local roads, then the street railways and tramways were put into the hands of private persons as matters of speculation and profit. The country authorities of many of our Southern and Western States lay out, and by road labor and taxation construct, the highways of the country, which are, as a rule, free highways, because this is conceived to be most conducive to the public interest. But even railways only five to ten miles long, eminently conducive to the welfare of the country, are permitted to go unbuilt until, by a spasmodic effort, the people of the country vote a bonus of nearly the legitimate cost of the road to be given to private parties who will guarantee the construction of the road, and charge exorbitant rates when it is done. In many of our States, again, what are called State roads have been established by special act, and made by local taxation and labor in the counties through which they run, but remaining free for the transit of all persons. But those same States undertaking to encourage the development of a railway system, do nothing of the kind. A company is incorporated to build, run and make profits out of the road. Counties and towns are authorized to vote large sums in aid of such roads—often enough to nearly pay for their construction, if economically managed, with the certainty that this aid will be, either by direct donation or cunningly devised foreclosure, a gift to the corporation or its managers. The United States, in times past, has built common highways at the public expense; but the Union Pacific, the Central Pacific, and we know not what other railroads, were given as spoil to the cormorant crew of Credit Mobilier Contractors, with results that neither you or I are proud of.

Hence, I lay down the general principle that the railroads of the country should be controlled and hereafter constructed by the authorities of the territory in which they respectively lie. A horse railway or tramway in the streets of a city should be constructed by its public authorities; a railroad lying within a township or county by its local authorities; a railroad passing through several counties of the same State should be built by those counties, or, if of sufficient general importance, even by the State itself; and a railroad lying in two or more States should be built by those States, or, if of sufficient general interest, by the General Government. All this should be done under proper State and National legislation, defining and limiting the powers of towns, counties, State and National authorities, so as to insure harmony of purpose and co-operation of work.

Assuming, as I believe, that Congress has the power to regulate commerce among the several States, by direct legislation or a board of commissioners empowered to fix the rates to be charged by existing and future transportation companies, and also to build inter-State canals and railways, we come to the practical question

WHAT HAD BETTER BE DONE?

Here we may delay a moment to say that the improvement of the Mississippi and lake-ways, so far as the same can be done quickly and cheaply, stand, in my mind, as matters of primary importance. Of secondary importance are the lock-water and canal navigation of the States of New York, the Virginias, Georgia, Illinois and Wisconsin, though these all have more or less merit. But we have two points to secure: First, speedy, cheap relief in the cheaper transportation of products; and, secondly, complete and permanent relief. The speedy relief must be cheap. The more thorough work that follows we can afford to make more expensive.

Now, the most speedy relief is possible in the shape of an act to regulate and fix maximum rates for the transportation of persons and property between the several States. This had better not be done by direct enactment of fixed rates, but placing a proper discretion in the hands of a commission to fix rates from time to time upon some specified basis of action. It could not be expected that such a commission could of themselves or immediately reduce rates to a minimum; but they could secure publicity of railway management. They could recommend and secure uniformity of legislation in the States, and secure more uniform and cheaper rates than we are now subjected to. Mr. Adams tells us that in 1869, freights between New York and Chicago fluctuated between $5 and $37.50 per ton, and this mere fluctuation is itself a great evil, more disturbing to legitimate traffic than high but uniform rates. The law should enable these commissioners to annually, or so often as necessary, to establish a rate which should be changed only on due notice, and not at the caprice of railway managers, or when dictated by the interest of transporters. Such a commission could not attain, but should hold in view the possibility of reducing rates to the lowest possible sum consistent with efficient management and a fair rate of interest on the investment. This point can only be partly attained by National regulation; roads constructed and operated by the governments of the Nation, States, counties and municipalities can alone reach this desired point, a point so essential not only to material prosperity, but to the free intercourse of the citizens of our vast territory.

NECESSITY FOR NATIONAL RAILWAYS.

Hence, while National regulatory legislation can effect much, and wise State legislation can effect more, I regard as the only final and complete remedy the construction or condemnation of all necessary lines of railways as public highways, first of the Nation, secondly of the States, thirdly of the counties, and lastly of the townships, towns or cities. As the part of this in which I would invoke National legislation, I would recommend the establishment of a series of east and west and north and south lines, which should endeavor to connect the centres of production, agricultural, mining and manufacturing, with the centres of consumption and exportation, in such manner that each section might have the full advantage of its special product, and each section obtain most cheaply what it does not produce. Take, for instance, the all-important articles of food, both for men and domestic animals, fuel and clothing. Take the census maps of 1870, and examine their teachings. Wheat, the bread-making grain of our land, is grown in totally insufficient quantity from Maine clear around the Atlantic coast, and through the Gulf States to Texas. It abounds in the ten Northwestern States, and in the far off California and Oregon. Corn, the great feeding, and to some extent, bread-grain of the New World, abounds in the Northwest, but is short in New England, and clear down the Atlantic coast. New England and Georgia nearly agree in saying that they can better afford to pay one dollar per bushel for corn than to grow it. Hay, which the southern planter needs to feed his animals used in tillage, is little grown south of the State of Kentucky, but is made in immense quantities throughout the North. Rice and cane sugar are produced only in the South, but largely consumed and wanted at the North. Of coal, becoming daily more essential as a cheap fuel for the supply of families and factories, the amount, though very large, is very unequally distributed, and involves now, and will yet more in the future, an immense amount of cheap transportation. Only twenty States and territories out of forty-seven are reported in the census of 1870 as engaged in mining coal, and of the nearly 33,000,000 tons mined, Pennsylvania produced 23,000,000, and Illinois and Ohio 2,500,000 each, narrowing the present production to a few States. New England is practically without a coal field; so are New York and New Jersey; and the want of cheap coal among their denser population and great manufactories increases year by year. Hence the want of an absolute prevention of the monopolies attempted of the Pennsylvania or any other coal field, whereby coal worth $3 per ton at the mouth of the pit, is sold for five times that sum to the struggling working men of New York city. So again with cotton, the great material of clothing, etc. Its production is practically confined to ten States lying on the Gulf of Mexico and Southern Atlantic, but it is wanted everywhere, and more than half its home manfuacture into goods is carried on at the other extremity of the Union. Manufactures generally are very unevenly distributed, but their results are wanted all over the land. New England manufactures $288 worth of goods per annum per capita of her population. The Northern Middle Atlantic States $194, whilst the cotton States produce but $18.

But I need not give further instances to show how unequally the various and valuable products indispensable to comfort and even the maintenance of life are distributed. I may add that large surplus amounts of these same articles of food and clothing material, at least, must reach the seaboard often from long distances for export, and articles of import must return the same way. The argument for cheap transportation in the public interest is overwhelming, and private enterprise, though munificently endowed with public grants of lands, bonds and money has not given and does not promise to give it. I need not farther specify perhaps to show that we need first, East and West lines to carry migration which follows the parallels of latitude, and the commerce and travel to and fro that follow the line of social, family and commercial connection that is preserved. Next, that we need North and South lines to exchange the great variety of products that are produced in one region and not in another, and ultimately it may be, when the country becomes filled up and migration measurably ceases, to become the great highways of our traffic.

Presuming these things, let me give the outline of a system of roads that would touch all the States of the Union, except those of the Pacific coast, and three or four more, and so give the opportunity to each State by a proper regulation of its own railway system, to put itself in connection with the National system, and secure the advantages of whatever cheapness and uniformity of rates that National system might secure.

PROPOSED GOVERNMENT HIGHWAYS.

Draw a line on the map from Bangor, Maine, through Boston, New York, Philadelphia, Baltimore, Washington, Lynchburg and Atlanta to Pensacola and Mobile, and you connect New England's manufactures, New York's commerce, Pennsylvania, Maryland and Virginia's coal fields and the rice and cotton fields of the Southeastern States, by a line run nearly parallel with the coast, and on the east side of the mountains. Draw a second line nearly parallel with the first, from Cleveland, Ohio, through Cincinnati, Louisville and Nashville to New Orleans, and the sugar and cotton of Louisiana and Mississippi may be exchanged for the butter and cheese of Northern Ohio, and the coal of Alabama, Kentucky, Tennessee and Ohio find a cheap oulet in either direction. Draw a third line from Milwaukee through Chicago, through St. Louis to Galveston, and the coal of Illinois, the iron ore of Missouri, and the sugar, cotton and cattle of Louisiana and Texas can be profitably interchanged. A fourth line, only a part of which is now demanded by the necessities of the case, would start from Duluth, pass through St. Paul, Des Moines and Topeka, and through the middle of Texas to the Rio Grande. Turn now and draw a line from Omaha through Des Moines, Chicago, Toledo, and from thence by such a line as to intersect as much as possible of the bituminous and anthracite coal fields of Pennsylvania, to New York, and you will furnish the wheat, corn and cattle and hogs of the Northwest in exchange with the manufactures of New England, and the imports of Boston and New York, as well as admit the coal of Pennsylvania by a second and cheap route into New York, New England and other coalless regions. Draw a second east and west line from Topeka through St. Louis, Cincinnati and Parkersburg to Baltimore, and you connect three great coal fields with regions that are destitute, furnish another great outlet for the teeming agricultural products of the West, and admit the commerce of Baltimore and Philadelphia at living rates to the Mississippi Valley. This line connects the winter wheat region of the country, and would abound in the best quality of flour. Draw a third line from Little Rock through Memphis, Chattanooga and Knoxville to Norfolk, and you again cut the more southern coal fields, carry the cotton and pigs of Arkansas to a better market, and rouse up the best and most neglected seaports of the South. Draw a fourth line from Shreveport through Vicksburg and Montgomery to Port Royal and Charleston, and you open up the cotton region to a more stirring and profitable commerce, and make corn cheap in Georgia and South Carolina.

These seven or eight lines of road, which I will call National roads, connect most of the State Capitals, the great commercial centres, and to a large extent the richest agricultural, mining and manufacturing regions of the country, one with another. They supplement rather than rival the waterways of the country. Measuring by right lines the distance they would travel, would be an aggregate of 7,500 to 9,000 miles, according to the number of lines. Each of these lines is independent and could be built separately, though of course they would much aid one another. They are to a considerable extent on routes already occupied by other roads, but these could be purchased or condemned for public use should that be considered preferable to building new roads. If built for cash, with a double track and three feet gauge, they ought to be built for $25,000 per mile, which is double the cost of the three feet six inches gauge railway of Canada, which I have already mentioned, and included right of way, fencing and law expenses, but does not include rolling stock. This would be about $25,000,000 for each line of railway, or $200,000,000 for the whole. It would be about $7,000,000 on the average for each State through which the roads ran; or an assessment of $6.50 per acre on each acre of land within three miles of a line, or two-thirds of one per cent. on the total wealth of the country. It is something *less than half the annual railroad charges* of the country. These $200,000,000 could be borrowed at 5 per cent., and the Government, if it advanced the sum, would be content with a return of that amount; but a railway corporation of the present day strives for 10 per cent. on all the stock it can manufacture. If Government would guarantee principal and interest, and appeal to the several States and localities, counties and cities through which the routes were laid, to take up a loan, either by public or private subscription for the purpose, it would be forthcoming in times less stringent than these. But in any event the money can be raised and used on these different lines contingent on the consent of the different States, which should be shown by their acquiescing in the action of Congress, and in the Governor of the State appointing local directors, who altogether should make up the Board of Directors for the whole system. But it should be kept steadily in view that the roads must pay their own expenses, the interest on the investment and a sinking fund to pay off the indebtedness, so that sooner or later all that the system will need to do will be to maintain itself. If possible, such a road should be operated by separating the ownership of the rolling stock from that of the road and simply charging tolls of transportation companies. If this is not practicable, then Government should go into the railway business. This is by no means impossible. Our present postoffice system is by no means perfect, yet it ranks as well as any of our larger railway corporations, with far more convenience to the public. Other countries have found that railways can be well managed by public officials; and so long as we have the management of the Erie canal to contrast with the management of the Erie railroad, we need not be told that the private officials of large companies are more faithful than public official.

Water transportation, in the future, will be a difficult question to deal with, only because of the uncertainty of its value as compared with the speedier and safer though more expensive methods of rail transportation. Whatever is done, the principle should be continually held in view that the water ways, whether rivers, lakes or canals, are the public highways of the country's trade and travel, and should be made, as nearly as possible, free highways. From Chicago, round the great chain of lakes, and through the Welland and Erie canals, transportation should be placed as near cost as possible. So in connecting the great lakes, and the Mississippi through Wisconsin and Illinois, and in cleaning the channel and mouth of the Mississippi, the channels of the Ohio and of the Missouri, we should hold continually to the idea that it is the public benefit that is sought in the mutual interchange of the diversified products of our great country.

Of the plans to connect the Ohio and Cumberland rivers through their head waters with the seaboard, by canals, I would speak respectfully but not confidently: and I could support neither, except on the condition of their dedication to the public use, which does not seem as yet assured.

But at whatever cost we must secure equal rights for all men, and equal rights we do not and cannot have, so long as our public highways of transportation are, in the smallest degree, used to tax the people for the profit of private persons. The robber barons of the ancient Rhine; the barbaric Moors at Tarifa; the Danes at Elsineur Sound, demanded tribute for safe passage of all who came their way. The savages of Africa, as Livingstone told us, make the same claims to-day—and here, in republican America, towards the closing of the nineteenth century, the old foe, in a new form, confronts us again. The robbers of the Rhine, and of the Straits of Gibralter are gone, and their castles are dismantled—

"Their good swords are rust,
Their bodies are dust,
Their souls are with the—saints, we trust."

The sound-dues have been peacefully abolished under the influence of a more enlighted international law, and these latter-day conspiracies against public welfare must go the same road or fare worse. The railroad kings must go where other kings have gone before them.

BROOM CORN.

BY D. M. FROST.

St. Louis, Mo., January 11, 1875.

Gen. John S. Marmaduke, *Secretary State Board of Agriculture:*

Dear Sir:—In reply to your communication of recent date, asking me to give an account of the method of "raising broom corn," I beg leave to submit the following account of how I deal with it:

KIND OF SOIL REQUISITE.

I plant only on deep, black alluvium. Other rich soils, in favorable seasons, will produce well, but cannot be relied upon.

The ground should be broken up as for field corn and as deep as possible, then thorougly pulverized with a harrow—the more like a garden it can be made the better—then rolled smooth and planted with a drill, the rows three feet apart, and the drill set to drop one good seed for every two inches. Any of the wheat drills can be arranged, by moving the teeth, to accomplish this. Some of the corn drills are also arranged for it. I have used a drill made expressly for it in Schenectady, N. Y., but find the wheat drill preferable on lumpy ground. The planting should be begun as early as the season will permit, and extend from day to day, through as much time as will be required to harvest the crop in order that it may be gathered before the seed ripens. The reason for this will be explained hereafter. As soon as the rows of shoots can be seen cultivation must commence, as it is, at first, of very feeble growth, and weeds are likely to strangle it. I have used the Buckeye sulky plow, with shortened axle, in its cultivation, and want nothing better. The shovels should be set to plow as *close as possible*, with rolling guards in place—and even if a few stalks are buried you will still have stand enough. Of course the shovels must be set to throw the soil from the rows. Having thus gone over your field, if your soil is rich enough to raise a good crop, you will find the weeds will require you to begin your second plowing, which should be done the same as the first, except to be deeper; and to acomplish this it may be found necessary to use only the two front shovels. Having gone over it in this manner, you may drop your guards, and with the front shovels alone plow it as deep as possible, still throwing the dirt away from the rows. If the growth should have been very rapid, you may find that the second plowing, mentioned above, can be advantageously omitted.

If your crop has been prosperous, you will find that the first planting has reached "knee high" by the time you have finished your third plowing, and you can now "throw the dirt to the rows," which you do by reversing your shovels (all four) and setting them wide enough to avoid burying the stalks, at the same time you will level down the ridges between the rows. Having finished this plowing you will go over it again, with the front shovels alone, and throw the dirt to it as heavily as possible with the sulky plow. This last plowing should be finished before the head begins to form, as after that the sulky plow will do it more harm than good. Any intelligent farmer will know that all that has been indicated to be done with the cultivator can be done, perhaps better, (though with more expense of labor), with the common, one-horse corn plow—as the object of all this plowing is simply to keep down weeds and loosen the ground. As soon as the stalks have reached "knee high" no weeds can trouble them, as after that the growth is wonderfully rapid; i. e., supposing your ground and cultivation both to have been good. Supposing that you began your planting (as you ought to have done at latest, in this climate) by the first of May, your first planting will be ready to harvest by the middle of August, and you should commence your cutting as soon as "the seed is in the milk," or at latest in the "dough state." If allowed to ripen, the brush reddens and depreciates nearly one-half in value. To avoid this, you should have a sufficient force to be able to cut in one day what was planted in one day, so that your season of harvest will occupy about the same number of days as your season of planting. By this means, and this only, will you be able, with any ordinary force of laborers, to get your brush cut green, which ought to be a *sine qua non* with all broom corn growers.

HARVEST.

As will be seen from the foregoing, the mere GROWING of broom corn presents but little difficulty and no great expense. The HARVESTING and CURING of the crop after it is grown, however, is a very different matter.

It is expensive to do in any manner, and difficult to do well. I will, however, as far as possible, endeavor to describe how to do it in the least expensive and best manner, and when I have told you all that can occur to me, there will still remain much that can only be learned by experience. I simply give you *my* experience.

I have now put up eight successive crops, supervising the whole operation myself, and yet I learn something about its management each year which I never knew before.

Before commencing your harvest you must have your sheds and machinery all ready. I say sheds because, although broom corn may be cured in the sun, and is often, yet the expense of handling, carrying and spreading it out in the sun, and taking it in out of the rain and dew would in the end be greater than the cost of good sheds, and, in addition, sun-cured brush is worth only about half as much as that cured in the shade.

Good sheds may be built by planting in the ground four rows of strong posts, the posts being six feet apart in each row, with six feet alley-way between the rows. You will then have three alleys, which you may make longer or shorter, to suit your convenience. You will then nail slats, three inches wide by one inch thick, by twelve or eighteen feet long, on each row of posts, with intervals of six inches from the top of one slat to the top of the next above. The lower slat should be at least a foot from the ground. Cut the outside rows of posts to a level at twelve to fourteen feet from the ground, cover the whole with a roof of clapboards or shingles; provide a quantity of pawpaw or other poles, seven feet long, and not less than one inch at the small end; then procure one four-foot and one eight-foot light step-ladder, and your shed is ready for business.

Your machinery will consist of a horse or steam power, which will drive your scraper (or thresher). The scraper consists of two cylinders armed with small teeth, two inches long, which revolve toward each other; two rows of tables, six feet wide and as long as the size of your crop may make necessary, will complete your threshing department.

The scraper alluded to is made solely (so far as we know) by Van Patten, of Schenectady, N. Y., who makes all kinds of broom corn machinery, and costs eighty dollars at his factory.

Having now provided the means of putting up your brush in a proper manner, it will be necessary for you to employ the requisite labor, which will be more or less, in proportion to the time you employed in planting, and consequently will have to employ in cutting. We will suppose that you have planted one hundred acres in twenty days, you ought then to reap five acres per day for twenty days, in order to have your brush all green and valuable. To do this you will require laborers as follows, to wit:

In Field.	*In Sheds.*
4 Breakers.	2 Threshers.
12 Cutters.	10 Bunchers.
2 Binders.	1 Carrier.
1 Loader.	1 Spreader.
2 Wagoners.	1 Seed hauler.
1 Driver for horse-power.	

DUTY OF BREAKER.

The first to enter the field should be the breaker, who places himself between the two rows going backward, and breaks, or rather bends down the stalks at the height of the hip, throwing a handful of the right hand row across that to the left, then a handful of that of the left across that to the right, and so on through the field, thus breaking two rows as he goes, and leaving what is technically called a "table," made of the crossed stalks. He should be careful to so bend down the stalks as to leave the brush protruding beyond the side of the "table."

DUTY OF CUTTER.

The cutter follows the breaker, provided with a sharp shoemaker's knife and a bit of whetstone in his pocket, to keep it sharp, going as "partners," one on each side of the table; they take the brush in the left hand, cut the stalk six inches below the brush with the right, and thus gathering a large handful, pile it in bunches on alternate tables, the butt ends *all one way.*

DUTY OF BINDERS.

The binders follow the cutters, and gathering the bunches, keeping the butt ends together, bind them into bundles, using a head of the brush as a binder, and a crooked one in preference, as least saleable, and lay them on the table.

DUTY OF LOADER AND WAGONER.

The wagoner in his wagon, with side-boards or a hay-frame, follows the binders, whilst the loader pitches the bundles to him and he packs them in his wagon. The wagoner should be careful that his wagon bestrides the vacant table and that he proceeds in the opposite direction to that taken by the breaker in making the table he bestrides. Having once started into the field he should keep on through, as it is very difficult, as well as dangerous to the horses, to turn in the broken corn. Having received his load he proceeds to the sheds and discharges it upon one row of the tables at the machine.

DUTY OF BUNCHERS.

The buncher stands at the second line of tables, and taking the bundles from the first, he separates the crooked from the straight and the short from the long brush, and placing each kind in handful crosses one handful over another at nearly a right angle with each other, and thus makes a pile of successive handfuls a foot high, which he then carries up to the thresher and lays on a bench at his side.

DUTY OF THE THRESHER.

The thresher takes handful after handful from the pile at his side, and inserting the seed ends between the cylinders it is instantly cleaned, then drawn back and thrown into an x shaped box at his side. Both threshers work at the same time, one at each end of the machine, one feeding with his right hand and the other with his left, both dropping the cleaned brush in the same box. The most industrious, intelligent, sober, faithful man in the whole force should be head thresher, for as he works all the rest have to work to keep him supplied with material. I always make him foreman, and he has extra wages.

THE CARRIER.

The carrier's duty is simply to carry the cleaned brush in armfuls from the box to the spreader at the drying shed.

THE SPREADER.

The spreader having placed two of the poles across an alley, the ends resting on the slats on either side, and a foot apart, takes the armful of brush from the carrier and spreads it out upon the poles, making each layer about two inches thick, and taking care to keep the butt ends of the stalks towards him. Thus he proceeds piling one tier above another, using his step-ladder when requisite, until he has reached the top tier of slats, when he recommences at the bottom and goes on as before. The brush thus disposed of is ordinarily safe, and will require no more attention until such time as the proprietor finds it convenient to bale it, when it will be ready for market.

THE SEED HAULER

has nothing to do but to keep the seed and track clear from the machine, and as it is, or ought to be too green, and therefore too much addicted to heating, to be of much service, it should be hauled to some convenient lane or pasture and there scattered thinly over the ground for the cattle, sheep and hogs to eat, which they will do greedily, and thrive upon it.

Much of the work referred to in the foregoing can be and is done by boys, and even by women, in the Eastern States, but I have found it, by experience, to be better to pay higher wages for the more steady and reliable labor of men.

BALING.

The process of baling can be accomplished in any hay-press. The brush should be placed in the press in small armfuls, the butt ends out and brush ends lapping in the center. I think it best to put thin slats of white oak at the corners of the bale to keep it in shape. I bind with No. 9 wire, and have found it profitable to take time and bale well.

GENERAL OBSERVATIONS.

Having now given you, as fully as possible, without becoming tedious, the process I follow in raising and curing broom corn, I think it proper to say something of the vicissitudes to which the crop is liable in this climate. In the first place the seed must be good, and this can only be determined certainly BY SPROUTING IT. The seed being good, if it is planted deep and wet weather follows, it will rot in the ground; if planted shallow and dry weather follows, it will burn up. Should it come up well it is still liable to the attacks of the cut-worm, and from this cause alone I have had to plant as many as three times before I got even an indifferent stand. The Chinch Bug has also done me much damage. When the tassel or brush is shooting, should the weather be moist and warm, it is liable to put forth so rapidly as to be weak and fall down, and thus make much crooked brush, less valuable than the straight, and finally, when it is ready to cut a high wind and rain may come together and beat it down so as to render it both difficult and expensive to gather. Having surmounted all these difficulties, however, and having your cleaned brush comfortably shelved in your drying sheds, and not spread too thick, your troubles are generally over. Still, should your spreader, through ignorance, or, more often, through laziness, have spread it too thick on the poles, you may in a week or ten days after it has been put up, find that it is not only not drying, but moulding. When this occurs there is nothing to do but to take all the affected brush down and spread it in the sun, and this must be done quickly or the brush will be absolutely worthless. The sunlight, and it alone, will, in a few hours, kill the fungu growth called "mould," and you may then pile the brush away, after beating off the mould, and bale it at your leisure.

Again, care must be used not to bale until the brush is thoroughly dried, else it will rot in the bale. When the stalk at its junction with the brush will break without bending much it will do to bale, and not before. It is proper for me to say that, without any fault of the spreader, certain atmospheric conditions arise, about every third year, which generate mould under almost any circumstances. These are hot, humid days, followed by foggy nights or mornings. The only remedy, and that not certain, is to spread thin and thinner each day while such weather continues. Examine your shelved brush twice a day and expose it to the sun as soon as mould appears. Its presence can be instantly detected by a peculiar odor "funky" which will be detected on approaching moulding brush.

Any, the slightest, mould damages brush, rendering it more or less brittle, whilst thoroughly good green brush can be tied into a knot, like a string. Having overcome all these difficulties and baled your brush into convenient bales of 250 or 300 pounds, put it away in a dry, dark loft or storehouse; light bleaches the outside and turns it yellow, and wait for a market.

And here again you will meet with difficulties, some of which I will endeavor to portray. The use of broom corn is almost exclusively confined to the United States, whilst we have good alluvial lands sufficient, if planted with it, to supply the world. The consequence of this condition of affairs has been seen for the last five years. In 1869 broom corn went up to a very high price. This induced farmers everywhere, North, South, East and West to go into it. Cotton plantations were converted into broom corn fields; small farmers throughout the North and West also went into it, in many instances venturing their all in a business they did not understand. The result was that the market was flooded with a huge mass of red, yellow and rotten trash, put up by inexperienced enthusiasts, at a heavy expense, and who were, in many instances, ruined by the experiment, the market going so low that in some cases, farmers shipping their brush to this city not only got nothing, but were left in debt to their commission merchants.

From that time to this (five years) broom corn has not been a paying crop, i. e., any other crop would have been more profitable. The price has now risen to a paying standard, owing to the fact of the surplus raised in 1869-70 having been gradually worked up and burned up in Chicago and elsewhere.

The danger now is that "all the world" will again go into the "broom corn business," and again glut the market with trash.

I cannot therefore conscientiously close this article without warning farmers of small means against undertaking this business. On the contrary, any one knowing the business, who has means sufficient to enable him to build drying sheds, supply himself with machinery, pay his laborers from cash in hand, and then hold his crop from three to five years for a price, may be pretty sure of doing well at it. Any one going into it should do nothing else and raise nothing else, except for home consumption, and then be endowed with a good supply of patience and means.

Following this plan, I have made the business pay very well, but I *have made but two sales in five years.* Five hundred pounds per acre is a fair average crop

TOBACCO CULTURE.

BY T. T. SETTLE.

The subject of the culture and management of tobacco is one which, while it has been discussed at much length, by able writers, within the past few years, is, at the same time, one which, owing to the many changes and improvements in its management, as well as in the various styles in which the "weed" is prepared for use by manufacturers, and the rapidly growing importance of the article as one of the "leading staples" of our State, would justify some further suggestions founded on actual experience. The time to begin preparations for the crop of 1875 being at hand, I desire, through the medium of your valuable report, to give your readers the benefit of my experience and observation, covering a term of twenty years, both as a grower and seller of tobacco. In the outset, I promise to give no startling discoveries or new theories on the subject, but will state facts which, for the most part, may be familiar to many of your readers, and my object in writing is to try and get such to practice better what they know, and others, who have given the subject no thought, and have never grown tobacco, to devote a portion of their farms to the culture of a crop for which our soil and climate are so well adapted, and which, when properly managed, yields a better profit than any other.

The plant-bed is the foundation of the crop, and is therefore of the first importance, and although it is an old adage among buyers that they never knew a crop to fail for want of plants, the crop of 1874, especially in the great tobacco-growing State of Kentucky, came very near being a total failure, principally from a want of plants at the proper time to set them. The best time to sow seed is in January or February, if the ground is not too wet or frozen too deep; but they may be sown as late as the first of April sometimes, and come in time for a late crop. The most successful farmers sow plenty of seed, and sow them early as well as late.

In selecting ground for plant-beds, choose rich, loose soil in your new ground, if clearing for tobacco; if not, in the woods, on some rich spot, where the sun will shine on the bed most of the day. Clear a space, say thirty feet square, of the grubs and large roots; rake off the leaves and trash, and then commence piling the brush by laying it first horizontally along that side of the bed from which the wind or breeze is blowing, to the depth and width of four or five feet, and extending across that side of the bed. Then continue the bed by setting the brush upright, with butts on the ground, and the boughs leaning against that which is laying horizontally. Set the brush as thickly over the entire surface of the bed as possible, mixing with an occasional good-sized stick of wood. It is important, in order to insure good plants, to burn the ground well, as it answers the double purpose of destroying the roots and seeds of foreign weeds and grasses, to prevent their springing up in advance of the tobacco plants, and also dries the earth and puts it in good condition to receive the seed in almost any kind of weather. In burning, set the fire on the side from which the wind is blowing, unless it is blowing so strong as to cause the pile to burn too rapidly to heat the ground sufficiently—the danger being not in burning too much, but the reverse. Three good men can pile and burn a bed ten yards square in a day. The following morning, the first thing, rake off the sticks, chunks and coals, which were not burnt, and with a mattock or grubbing hoe, pulverize the ground well, by digging to the depth of four or five inches, carefully removing roots of any considerable size, which last may be done best with a fine rake.

When the bed has been thoroughly pulverized and ready to be sown, mark it off in lands, five feet in width, with the hoe or rake handle, and cross in the same manner in the opposite direction. Mix with a common washpanful of dry ashes, one tablespoonful of seed (and no more), not heaped, but level full, and sow the ashes and seed over the ground, in the same manner as sowing wheat; sowing first over the bed in one direction, and then in the opposite one, so as to distribute the seed uniformly over it. After sowing, rake the ground lightly, and then tramp it until level and comparatively smooth. Cover lightly with green brush having no leaves on it, to protect against late spring frosts, and to keep leaves which may fall from adjoining trees from covering the young plants.

Many farmers imagine that their failure to obtain full prices is attributable to the kind of seed they sow, and are continually hunting new varieties, when in reality they may be using the best, and the fault lies in another direction. The best variety to sow will depend on the soil to be planted and purposes for which the tobacco is to be used. If to be planted in old land or manured lots, which are best adapted to the growth of heavy fat varieties of tobacco, called shipping leaf, then the Blue Prior or Morrow are excellent varieties. For bright wrappers or fillers for chewing tobacco, the Orinoco, Yellow Prior or Little Vic are preferable. The Little Vic is now preferred by some of the best growers of bright wrappers in Kentucky, being, as they assert, much easier to cure a uniformly bright color, while it also possesses all the desirable chewing qualities of the other varieties.

It is said that one bed, the size we have described, will furnish plants for ten acres; but if we intended planting ten acres, we would have at least three such beds, and would prefer four, so that if one failed in part, the deficiency would be made up by others.

It is a well established fact that the most successful tobacco growers are those who get their crops set early, and in order to do so, it is indispensable to have an abundance of early plants. We would, therefore, recommend the sowing of seed in January, February, and also in March. It is a very common fault to sow too much seed on a bed. When they stand too thick on the ground they grow up very slim and do not grow off readily when transplanted. In preparing new ground for planting, it should be broken first by a coulter plow, which cuts the roots well, then turned over by a two-horse turning plow, harrowed well each way; the roots, sticks, etc., piled and burned; then laid off in rows three feet four inches each way, with shovel plow. A small hill, at the crossing of each furrow, should be made, say two or three hoefuls of loose soil, to which give a sharp pat with the hoe in order to better retain the moisture after the plant is set. If bright wrappers is the aim, and especially if your new ground is rich, the rows may be only three feet one way, by three and a half the other.

In fact, some of the best farmers in Kentucky, among them Mr. R. R. Wakefield, of Ballard county, have recently adopted drilling; that is, they plant only about two feet apart in the rows, which is the usual width apart, and only plow one way. In this way they obtain a more silky leaf, a finer fibre and better color; and although the leaf is smaller by topping high, say fourteen to sixteen leaves to the plant, with the increased number of plants the yield is equal and sometimes greater than by planting the usual distance. Old land should be fallowed deep in the fall if possible, in order to turn under the weeds and grasses, and give them time to decay and enrich the soil, and it also gives the cut-worm a good opportunity of freezing—a thing to be desired, as it is often very destructive to the plants when first set in old land, but never much trouble in new. Old land in the spring should be prepared in much the same way as new, except the rows should be three and a half feet apart each way, which gives 3,500 plants to the acre.

Plants will live when transplanted in fresh lands after a very light rain, but in old land a good soaking rain is desirable in order to insure success, besides it damages the plant-beds much less to draw from them after a good rain. Care should be taken when drawing plants from the beds to avoid trampling on the young plants, and only one plant should be pulled at a time, for by pulling a handful with half a dozen which are large enough to plant, there will be sticking to their roots perhaps fifty smaller ones, which would be large enough in a week or ten days, and which may be needed. Three experienced hands can draw the plants and set four or five acres in a day; and were I intending to plant a full crop, say four to five acres to the hand, I would prefer to have at least two-thirds of the crop planted during the first season, *i. e.*, at the first planting, and that as early in May as possible, and the remainder within ten or fifteen days thereafter. However, there are but few farmers ready to plant before the 15th of May, which is ample time, and good crops are made when planted as late as the middle of June, and sometimes later. It may be objected, that too much of the crop should not be planted at once for fear of having so much to ripen at one time, as to be unable to house and take care of it properly; but the reverse is ussually, if not invariably, the case; and much more tobacco is cut too green than is damaged by standing in the field too long—besides fully a third of the most regular stand, all planted the same day, will mature a week or ten days later than the other two-thirds. Plants to set in old ground should be of good size, say from four to six inches high, while smaller ones will do well in new ground.

The process of transplanting is simple, and consists of making a hole in the hill, which will receive the plant well up to the leaves and pressing the soil firmly around it, taking care not to leave a hole below the roots of the plant. Fresh land requires less cultivation than old, being quicker and free from weeds and grass comparatively—two to three good plowings and hilling once with the hoe, are sufficient. Old tobacco land should be plowed at least four times and hoed twice. The matter of cultivating the growing plant, however, as it depends a great deal on the kind of season, whether wet or dry, will have to be left to the discretion of the farmer. In no case should the ground be plowed while very wet. Before the plant is hilled up, which is the last cultivation it gets, and when it is about large enough to stop, the bottom leaves should be broken off (which is called pruning) from the ground up from four to six inches, according to its size.

Topping, which is breaking, or rather pinching out the bud of the plant, in order to cause it to spread and mature, and also to prevent it running to seed, should be postponed as long as the circumstances will allow, so as to top as much of the crop at one time as possible. Early in the season, old land tobacco should be topped at ten leaves to the plant, which can be done without counting, by leaving the two top leaves hanging directly over the two bottom ones. Late tobacco should be topped at eight leaves to the plant, which is also done without counting, by pinching out with the bud those two leaves which hang directly over the two bottom ones. Within a week or ten days from the time tobacco is topped, the suckers, which sprout just above each leaf, and also at the ground, make their appearance, and should be broken off when from three to six inches long. If neglected, they become so hard and so firmly attached to the stock as to bring away the leaf with them, and if entirely neglected would absorb all the nourishment from the plant, and cause a total failure. There are generally three crops of these suckers, all of which must be attended to at the proper time. The work of keeping off suckers and horn-worms is all the farmer has to do from topping until cutting and housing time, and is generally all he wants. There has been no way discovered to prevent the appearance of the horn-worm, nor to keep him from imitating the example of his illustrious neighbor, "Young America," in chewing tobacco—in fact, he seems extravagantly fond of the green article, and claims it as his birthright, being born (hatched) on the leaves from an egg deposited by the tobacco fly. They are not usually abundant until about the full of the moon in August, which important fact furnishes a strong argument in favor of early planting; for tobacco planted in May is generally so near ripe by the 15th or 20th of August, that young worms can do it but little injury.

The simplest and best way of disposing of these pests, is to pull their heads off as quickly as possible. Some writer, who evidently labors under the delusion that they come to and go to eating again as soon as the farmer's back is turned, suggests gathering them in tin pails, and carrying them out of the field to destroy them. They certainly never eat any more after their heads are taken off, and while one's hands are liable to be slightly soiled, this is the best mode of treatment, as both hands and eyes are needed in worming and suckering, both being carried on at the same time. It is much better to kill the worms while quite small, as a full grown one will destroy a plant of tobacco in a very few days. Whole fields are sometimes ruined by them, but we have always doubted the statement that they sometimes crawl on top of the fence, and ask passers by for a "chaw." The time usually necessary for tobacco to mature after transplanting is about ninety days, but varies some, according to soil, climate and the season.

Tobacco should never be cut until thoroughly ripe, unless forced to do so by prospect of frost. New ground tobacco, when ripe, turns to a yellowish color, and old ground becomes spotted; and both are brittle, and the leaf breaks easily by being pinched up between the thumb and finger.

If the crop is large enough and the force sufficient, enough should be cut in one day to fill a barn, so that the process of curing will be uniform. Cutting is done by splitting the stalk with a sharp butcher knife, from the top to within two leaves of the bottom, and cutting off just below the bottom leaf. The plant is then inverted and set over the stubble from which it was cut. As soon as it falls or wilts it is put in piles of ten plants each, with the butts toward the sun. If the sun is shining very hot, care must be taken to prevent sun-burn, which injures it very much. Piling as above will generally prevent this. Each pile is hung on a stick, and if the tobacco is very large eight plants to a pile is sufficient. Stick your stick in the hill adjoining the one on which the tobacco is piled, and slanting slightly, and hang the tobacco in the field, instead of hauling to the barn or scaffold before hanging it, as it saves time and is bruised less. As soon as hung on the stick, haul directly to the barn, and hoist from the wagon to the tier poles, filling each room of the barn from top to botton as you go.

A convenient sized barn is twenty feet square, five firing tiers high. The lower tier poles should be about eight feet from the ground, the next three and a half feet above, the third three and a half above the second, and so on to the top. They should be four feet apart, giving five rooms in the barn from bottom to top. Such a barn will hold one thousand sticks of tobacco, usually about three acres, and can be built of logs at trifling cost. The sticks should be four and a half feet long, so as to lap the tier poles well and to prevent their slipping off. Scaffolding in the field has been entirely abandoned by the best farmers in Virginia and Kentucky, except when the tobacco is to be sun-cured. The distances between the sticks when hung in the barn should vary somewhat, according to the size of the tobacco, the amount of sap in it, and the process by which it is to be cured, from six to eight inches; and if intending to cure by action of the atmosphere, the barn should be quite open, and the sticks should hang ten inches apart at least.

We now come to the process of curing—the most important as well as the most difficult, part of the work—requiring all the energy, watchfulness and intelligence the farmer can bring to bear. To cure the heavy, dark varieties for export, called shipping leaf, the usual mode of firing is supposed to be the best; and as a bright color is not indispensable to its value, the less fire used the better, so that it is saved from house-burn until cured fully. This does not apply, however, to a large and valuable proportion of the Missouri and Illinois crops, called shipping leaf, and suitable especially for the English markets. This should be cured as bright as possible, which can be best done by the use of flues or charcoal: and at the same time avoid the very objectionable flavor and smell of smoke. In fact, the less smoke any kind of tobacco has, the better it sells; and when charcoal or flues cannot be had, as much of the curing as the weather will permit should be done by the sun and air. If the weather is fair and the barn room ample, tobacco will cure by the action of the atmosphere in about ten days, with the assistance of very little fire, and will be much sweeter and more valuable than if cured quickly by hard firing.

The climate, and a large proportion of the soil of Missouri, are as well adapted to the production of those fine and high-priced varieties of tobacco used in this country by manufacturers of both plug and fine-cut chewing, as Virginia, North Carolina or Kentucky; but our farmers have not yet attained anything like the perfection in the management of their crops, and consequently do not get near such prices. The use of flues for curing bright manufacturing leaf is gaining in popularity every year, and we have yet to see the first farmer who ever tried them and abandoned them for any other process. Less than ten years ago there was not one in western Kentucky, and now a very large proportion of the farmers of that section cure their entire crops with them, and they invariably get nearly double as much as the same tobacco, even with the same color, would bring if cured by firing in the old way. Even if they fail—as they sometimes do with any process—to get a strictly bright color, the tobacco is so sweet and has that peculiar flavor which manufacturers desire. Besides these advantages, they are very much more convenient, saving a great deal of fuel, and the farmer is saved the disagreeable task of smoking his eyes out.

The construction of the flues used in Ken tucky is very simple and not very expensive. Two parallel nine-inch brick walls, about eighteen inches apart, and eighteen or twenty inches high, across the center of the barn, and these brick walls covered with cast iron caps twenty inches square, and so made as to lap each other half an inch where they join, with a brick furnace to receive the fuel on the outside of the barn, and a chimney six or seven feet high on the opposite outside of the barn, to carry off the smoke, completes the flue. The flue should extend through and a few feet beyond the barn, and the chimney should be that distance from the logs or planks to avoid danger, as the blaze sometimes reaches through and out at the top of the chimney. Such a flue can be built at a cost of $75 or $85. The cast caps should be slightly arched, as they throw out the heat better.

As soon as the tobacco is housed, the fire should be started in the flue, and a low degree of temperature, say about 95°, kept up for ten or twelve hours, until the leaves are yellow, when the heat should be gradually increased to 120°, and so remain until tails are partially cured and curl up, when the heat should again be increased to 160°, and kept so until the leaf is thoroughly cured, and the stalk nearly so.

In order to regulate the heat, a thermometer must be kept hanging in the barn in a corner and frequently referred to. While the above is as near a rule as can be given, yet the judgment of each farmer and in each particular curing will be needed, as the amount of heat necessary will vary according as the tobacco is light or heavy, the season wet or dry, etc. As an instance of the profitableness of flue-curing, the writer sold in St. Louis in 1874, at least one hundred hogsheads of bright wrappers from two counties in Kentucky, mostly flue-cured, at prices ranging from $30 to $90 per hundred pounds—two entire crops averaging over $55—while fire-cured from the same neighborhood, with as good color, seldom reached $25, and mostly sold under $20 per hundred pounds.

Coal-curing is practiced successfully in Virginia, North Carolina and portions of Kentucky, as well as in this State, but it is not so certain of success as to color, is more trouble, and in the end more expensive than flues. To cure with coal, a thermometer is needed, and the amount of heat necessary the same as with flues.

After the fires are withdrawn, the tobacco in a short time will come in case, unless the stalks are entirely dried; and then, if a good bright color has been obtained, it should be hung in the barn as closely as possible, by putting two or three sticks in the space occupied by one, to prevent its losing its color by the damp spells of weather during the winter. It will dry in this condition, and remain so until stripping time in the spring; or, if stripped during winter, should be hung back on sticks, and kept crowded until ready to prize.

Having rather tediously followed you through the laborious and disagreeable part of your work, we now come to the comparatively easy, but decidedly most important, because most profitable part, namely: stripping, assorting and prizing; and here allow me to say that the farmers of Missouri, as a class, are far behind those of the other tobacco growing States. This is attributable mainly to the fact that our farmers, after working a year and making a crop, in order to save a few weeks extra labor, are in the habit of not marketing that crop, but turning it over to some country re-handler or speculator at a sacrifice, and he about half-way prepares it for market.

It looks reasonable that if a re-handler can take the tobacco as the farmers deliver it, tied in large bundles, lugs, leaf and trash all together, and assort it, and make one bundle into four or five, at an expense of one dollar and a half or more per 100 pounds, that the farmer can better afford to do it right at first. The farmers are told that "we buyers" would rather have it tied thus, so that we can assort and classify it to suit ourselves, and when so tied, the competition is gone, except as between the two or three country buyers in each county; whereas, by properly assorting, tying and prizing, which the farmer can do much cheaper than any one else, he gets not only the competition of all the great American markets, but has his crop in a condition to ship to any market in the world.

It would not cost farmers over fifty cents per 100 pounds in excess of the present mode of delivering to country dealers, to prize their crops properly, and the work, in a great majority of cases, would pay them better than any other they could do.

Shipping leaf should be carefully assorted, putting all the ground leaves, bruised or sunburnt, etc., into lugs, and the leaf should be neatly tied in bundles of not over six leaves. The lugs even pay to tie into small hands. At present prices there is a difference of at least $1 per one hundred pounds in favor of small hands in lugs, and from two to four times as much in good leaf.

If tobacco is too soft when stripped to prize, it should be hung back in the barn until thoroughly dry, giving good room between the sticks for the air to circulate. It may then be taken down the first damp spell and bulked ready for prizing. Tobacco intended for the English market should be prized in much drier condition than for any other, owing to the fact that there is an import duty in that country of over seventy cents per pound on the article, and the importer wishes to pay duty on as little water as possible. A large proportion of the shipping leaf of this State is prized by the country operators with a view to the English market; and we think if managed differently it would do better for some other markets, and can be prepared with less expense. For instance, we would prize all dark, heavy leaf in simply good keeping order, and not in what is called "factory dried," and only factory dry that which is bright or colory. Dark shippers should be prized in hogsheads of 1,600 or 1,700 pounds net; lugs, 1,800 to 2,000 pounds net; factory dried, 1,250 to 1,400 pounds net. Care should be taken in all kinds to handle neatly, and not put two kinds in one hogshead when possible to avoid it.

Bright wrappers and fine fillers should not be prized so as to bruise the leaf, and if very fine wrappers, should be put in half hogsheads, or tubs of 300 to 600 pounds net; fillers from 800 to 1,000 pounds. The most important point in these varieties is the assorting or classification; and if our farmers will once get to prizing their crops, and attend the St. Louis market in person occasionally, where they can see specimens of the best managed crops of this and other States, they will soon learn more than can be written on the subject in many long articles, and the information will be such as will lead to their prosperity; and if only a few of them will try the experiment, my object in writing this will be accomplished.

PRACTICAL SUGGESTIONS CONCERNING SEEDS.

A seed is a germ or substance, either animal or vegetable, produced in the natural order of things, and from which nature reproduces the same species.

"Like producing like" is a general law in either the animal or vegetable kingdom. We propose some observations on the seeds of the vegetable kingdom.

Here we always expect a fruitage or crop, the same in character as that of the parent plant producing the seed. Variations in quality or quantity from that of the parent we do not regard as violations of the law, but attribute these differences to the changed conditions under which the seed germinates and matures its fruit.

The product of the seed of a peach, a melon, a kernel of corn or of wheat from the same seed, if grown in Minnesota will not exhibit the same characteristics as if grown in Missouri, and in either locality the character of the product will be influenced by soil, whether clayey and cold, or sandy and warm, and will be affected, too, by excess of heat or moisture. Yet this does not violate the law. Like produces like under similar or nearly similar conditions.

In our State the seeds for the farm are the most important, and first the cereals, corn, wheat, barley, rye, oats, etc., and next hemp and tobacco. Every intelligent planter is ever seeking the seed for each of these that will produce the best quality and largest quantity to the acre. Our climate and soil will have as much to do in giving character and results to crops as will the seed we put into the ground.

Seed corn brought from the North will not retain here from year to year the character it had there.

Tobacco seed obtained from Cuba or the Connecticut Valley, where the soil has been cultivated for some two hundred years, will not continue to produce here Havana tobacco or Connecticut seed leaf.

The writer, more than twenty years ago, before the days of railroads in Italy, saw, while riding down the valley of the river Po, hemp growing as high as the roof of a French diligence, and in soil cultivated before the commencement of the Christian era, and was informed that the British government obtained from that country the hemp to make the cables for its navy, but it is not probable that hemp seed brought from the valley of the Po and sowed in Missouri would produce a similar crop, on account of difference in our soil and climate.

The same liabilities will attach to the products of seed wheat, barley, rye or corn, brought from elsewhere and sowed in our soil and under our skies.

If any one could read the correspondence of the commission houses and seedsmen in St. Louis, they would be puzzled and amused at the inquiries and orders for seed wheat, corn, tobacco, etc., under names that scarcely any one ever heard of, except the writers, and which, by the name given, no one can tell what is wanted, and the order is filled with something on a guess, or most frequently returned unexecuted.

The party ordering has heard of a seed under that name, or has read some advertisement of it, and expects to obtain the promised results, and probably will be disappointed.

Our farmers in the main should depend on themselves for obtaining the seed grains of hemp and tobacco best adapted to produce the largest crops.

It is well to try varieties in order to select the best. In making choice, let some standard of excellence be fixed upon, and then select for it. In corn, look for the number of rows on the cob, the length of the ear, the smallness of the cob, the depth of kernel, always looking for the greatest weight of shelled corn to the ear. In wheat, look for the largest number of berries to the head, and in selecting any grain for seed, always select in the *field* from the *growing crop* such specimens as come up to your standard of excellence, and not take corn for seed from shelter nor wheat from threshing machine.

Only these carefully selected specimens should be used for seed, and this process of selection may be carried still farther by planting or sowing the extra fine samples in a piece of land by themselves for careful cultivation to bring them to greater perfection, and in this way seeds for our staple crops may be produced that will be habituated to our soil and climate that will have a character of their own that will make them more sure, the condition of season being the same, to produce their "like," and will lessen the liability to deterioration.

There are corns grown in the eastern part of the State that maintain their qualities from year to year. How they originated the writer is not informed, but there must have been at first some selection by some careful farmer, and soil and climate have done the rest.

St. Charles White and New Madrid Yellow, are corns well known in the market. There may be other varieties more profitable to grow, yet these have a value of their own, and by careful attention to selecting seed, even these may be excelled.

It is not every farmer that has the habit of careful observation and patient painstaking necessary to selecting and perfecting the quality of seeds. Chance does not often secure this improvement. It is the result of some one's careful observation and labor. There are a few observers in every county, and these few become public benefactors. Let these bring together at the Agricultural Fair the result of their studies and experiments, until the best seed for each crop in that county shall be settled upon.

Our State is extensive, and abounds with variety of soil and climate. Seeds for the various farm crops that would succeed well in Clark county might not be so sure of the best yield in Greene county. Each locality in respect to soil and climate should produce its own seeds for general farm crops in the mode indicated above.

VEGETABLE SEEDS.

It was the object of this paper to point out more particularly the safest mode of obtaining reliable seeds for the kitchen garden. No statistics ever yet taken show the economic value of the products of the kitchen garden of any one county, much less of any one State. The numbers of quarts of peas, beans and sugar corns; the bushels of beets, onions, turnips, and several score of other vegetables from the garden, daily gathered by the busy hands of our house-wife, has never yet been counted. Tens of thousands of them gather every day in their season, and the money value of the gross product is never estimated. The sum total for such a State as ours must be immense, yet by the large farmer is overlooked in its detail as of small importance, and yet what table is well provided with healthful food from which the vegetables of the season are absent, and what home in the country is complete without its kitchen garden and flower plot?

The vegetable seeds used in our State are for the most part grown elsewhere. A few are saved by careful family gardeners, and by the market gardeners in the vicinity of our large cities, and but a small quantity from either source ever find their way to the general trade. We must look elsewhere than to our home production for our main supply of both vegetable and flower seeds.

The question arises, from whom shall they be obtained?

A few years since in the East a sharp discussion was carried on as to the surest and most economical mode of growing and obtaining the purest and best seeds, whether by the seedsman owning the land and necessary buildings, and growing them on one farm and under his own inspection, or by furnishing the pure stock seed, and having them grown for him by contract on different farms and in different localities, those best adapted to produce any particular seed to perfection.

Much can be said on both sides. No one seed farm can produce all or nearly all of the varieties of seed required for a complete vegetable garden and purchase from other growers, as growing by contract must be resorted to even by those who have large investments in lands devoted to seed-raising. If pure stock seed be provided, any careful gardener or farmer may grow the seed, care only being taken to go through the growing crops at different stages of its growth from the seed leaf, at the time of blossoming and at maturity, for the purpose of culling out every hybrid or sprout.

The point essential for the growth of seed true to name, is to sow only from carefully selected stock of the true type, and to reject every vegetable growing for seed at some stage of its development if it shall not bear the marks of the true kind.

There is great similarity in the list of seeds offered by respectable seedsmen throughout the country. Those that care for their reputation obtain their supplies by one or both the modes indicated above, yet there are those that scatter seeds in immense quantities over the country that cannot obtain sufficient supplies in either of these modes, and to get the amounts required for their purpose are compelled to buy of irresponsible growers and at less prices than the true and genuine articles can be produced. There are dealers in seeds that will buy cheap lots because they are cheap, and cheap seeds are the dearest things a farmer or gardener can purchase. A respectable dealer will have nothing to do with these cheap lots that are continually offered by those that by chance have raised a crop of seed of some vegetable that was not grown for seed.

A complete catalogue of seeds contains the names of the standard varieties, and if a series of catalogues of the leading seedsmen of the country for some years past be examined, but very few changes in the leading varieties will be observed.

Some new varieties appear, most of them of doubtful value, very few holding their place for a series of years.

In selecting an assortment of seeds for the garden then, it is not advisable to select the new named varieties, but to confine your list to the old and well known sorts.

If you are not sufficiently familiar with the names of these to make a selection, the catalogue of any respectable seedsman will afford you the required aid, or which is better, correspond by letter with a seedsman known to you, and you can obtain all the information necessary to enable you to make a complete and economical list. He can tell you how many of the leading sorts you need for a complete family garden, and how much of each sort you ought to order for a given space of ground or a given number of persons in a family.

Under the present postoffice law, seeds can be received by mail at a trifling expense. It costs but one-half cent per ounce, or eight cents per pound, in packages not to exceed four pounds, to receive seeds through the mail. This postage is prepaid of course by the sender, and ordinarily he does not add the trifling cost of postage to the price of seeds, and any one can get their seeds at as low a price by letter as they could in person over the counter.

Too often the farmer rather than write a letter will take any seeds he can find in the neighborhood to the detriment of his crop of vegetables.

The varieties of seeds advertised to be the earliest are not, as a rule, those that are most desirable for a family garden. Earliness is a quality sought by the market gardener in order to obtain the high prices paid for the first vegetables of the season. This quality is obtained by selecting seed from year to year to that end, and usually at the expense of quality and quantity. As a rule the quality or flavor of the extra early varieties of almost every sort of vegetables is inferior to the second early and main crop.

Every one will be inclined to save all the seeds possible from their own premises. Economy suggests this, for why should money be expended for that which can be supplied at home and so much saved and added to the sum total of the profits of the year.

Whoever would save seeds must first learn what are the qualities exhibited in the pure vegetable, in order that he may know from what specimens to select seed for his future stock. The following by one of the oldest and most experienced horticulturists in the country may give some hints as a guide.

"In the Blood Beet, we always look for deep color, smooth, handsome form, small top, and sweet, tender flesh. In the Orange Carrot, small top, smooth root, and deep orange color. In the Cabbage, short stump, large compact head, with but few loose leaves. In the Cucumber, straight handsome form, and dark green color. In the Lettuce, large close head, pleasant flavor, with the quality of standing the heat without soon running up to seed. In Sweet Corn, long ears, very shriveled kernels, filled over the end of the cob. In the Cantaloupe Melon, rough skin, thick, firm flesh, and high flavor; in the Watermelon, thin rind, and bright red core. In the Onion, thick round shape, deep color, mild flavor, and good keeping quality. In the Parsnip, small top, long smooth root, sweet flavor. In the Pea, low growth, full pods, and large tender peas, rich flavor. In the Scarlet Radish, deep color, small top, clear root, and quick, free growth. In the Squash, medium size, fine grained, deep-colored flesh. In the Turnip, handsome form, small top, and tap root, sweet, crisp flesh."

The gathering of seeds should not be done indiscriminately from every plant, but by careful selection form the best, and from those only that have the points of the pure vegetable. By selecting only the best plants and the best seeds from the best plants, even good varieties may be improved, and no variety with this carefulness in selection of seed will deteriorate "Like producing like" is a law in the vegetable as well as in the animal kingdom.

An intelligent breeder of stock breeds only from those animals which possess the points he wishes to perpetuate, and thus by selecting seed only from vegetables possessing the qualities desired we may expect those qualities to be reproduced.

In this way many of our choicest sorts of vegetables have been obtained. For example, if you will select the earliest peas and largest and fullest pods from the earliest vines for a number of seasons in succession, a variety ripening several days earlier than the pea originally sown may at last be secured.

There are difficulties to be met with in saving seeds at home and at the same time preserve the several sorts distinct. There is ever present a tendency to deteriorate and to intermixture. If two or more varieties of the same vegetable are permitted to blossom at the same time near each other, they will, by the insects or the wind carrying from one to the other the pollen or fertilizing dust, intermix and produce a hybrid partaking of the character of both parents. The distinctive qualities of each vegetable will in this case be lost and a variety produced that will not be worth cultivating. It is just as hazardous to allow vegetables of the same family to seed in the vicinity of each other as to allow a rough scrubby bull to run with a herd of thorough-breds and expect progeny of pure stock. In each case a crop of mongrels will most probably be the product.

The gathering of seeds should not be unnecessarily delayed, for they may be devoured by birds or the pods burst and scatter their contents on the ground, and thus all your labor be lost. So soon as the seed vessels or pods are gathered they should be spread upon a cloth in the shade until they are perfectly dry, and then be rubbed out by the hand or threshed out by means of a small stick. The chaff and defective seeds having been separated, the seeds should be put in paper bags, each bag labelled with the name of seed and year of growth, and laid away in any place that is dry and of even temperature, on the upper shelf of a closet in the interior of the house, next a chimney is the best, but not in a closet against the outer wall of the house, or which is still better and avoids the mice, put the paper packages in cotton bags and hang to the ceiling of a dry and well ventilated room, the garret usually being as good as any place that can be chosen.

Many seeds will retain their vitality for a long time if well matured, and stored in a dry and even temperature. If kept in a close, damp atmosphere, they will soon lose their germinating power.

As a rule, fresh seed are the best; some are just as good three or four years old as they are at one. Asparagus and beets are good at two years; carrot, egg-plant, parsnip, salsify, onion, peas and beans are best of the previous year's growth. Cabbage seed are good for four or five years. Turnip, radishes and lettuce are good for two years. The vine seeds—melon, cucumber, pumpkin, squash, etc.—are thought by some to improve by age; they certainly retain their vitality for a very long time.

Ordinarily, on account of the liability to mixture and deterioration, and of the care and time required for careful selection, it will not pay the farmer to save the seed of any large number of vegetables.

Here and there, a careful and painstaking housewife will do this to the benefit of her own family and the benefit of her neighbors, and often an individual will obtain for a neighborhood a vegetable of more value for that locality than can be grown from seed brought from elsewhere.

It is the business of a first-class seedsman to offer those seeds only that are pure or without mixture; that are fresh, having every condition, so far as can be known, to secure germination, and that are true to name—that is, the seed will produce the variety designated and expected from the title or name under which they are sold. No reliable seedsman will vend seeds that are worthless for the sake of a small immediate profit, and risk sacrificing the reputation and trade which it is his interest to build up and extend. A few dollars will obtain the seeds necessary for a family, and those that are not saved at home, it is best to obtain from some long-established and well-known house. There are not many such in the broad extent of our country. Thousands have engaged in the business of supplying seeds, and the major part, for want of knowledge or conscientiousness in managing the business, have disappeared. The business of a seedsman is like that of an apothecary. Your physician gives you a prescription to be filled by the druggist. You do not know what you get only by the result. You trust the apothecary that the package in your hand contains the desired drug. By inspection you may know nothing about it, and will not till you have used it. You are confiding in the carefulness of your druggist, and in the same way you give an order for seed, and for the quality of the articles you have in your packages you must trust to the carefulness and honesty of your seedsman. By examining the seeds, you cannot tell whether they are pure or will grow. You buy them on trust. Choose then a seedsman of long-established reputation, for supplying you with seeds for your main crop. Avoid seeds that are carelessly handled; those that are hawked about the whole country, and put on sale at every cross-roads and corner grocery, for the chances are that seeds distributed in this wholesale manner, gathered again from all sections and redistributed to others, will not be preserved pure, true and fresh, from year to year.

MEADOWS AND HAY-MAKING.

BY DR. H. CLAGGETT.

SIR: In compliance with your request, I present fully, for your Annual Report, the result of my experience in the preparation and preservation of meadows, and hay-making.

Hay may be classed among the important farm crops for feeding on the farm; and in the vicinity of towns and cities, as one of the most profitable crops for market, and with their growth will be of increasing importance.

It is, therefore, important to every cultivator of the crop to discover and practice that mode of cultivation that will yield him the largest reward for his labor and capital.

I am well convinced, from experience and observation, that many farmers suffer serious loss from negligence in the preparation and preservation of meadows, and from erroneous views disseminated by some theoretical writers, as to the proper time for cutting the grass, claiming that it should be cut in the bloom.

Among the variety of grasses used for making hay, we know none of equal value to timothy, (phleum pratenso) for feeding working animals on the farm, or for market. Any mixture of other varieties detracts from its market value.

In the preparation of meadows, the points that claim our attention are to get an even and well pulverized surface, free, as far as practicable, from the seeds of weeds and any other grasses, except the kind we propose to grow. To that end we should precede the sowing of timothy with such crops as are best adapted to free the land from other seeds. Oats is among the best for this purpose. The ground should be ploughed soon after the oats or other crop is harvested, and again stirred, harrowed, and rolled early in September; and as soon thereafter as the ground is found sufficiently moist, well matured, clean timothy seed may be sown at the rate of seven or eight quarts to the acre, which should be lightly covered with a brush, or, what is better, a Thomas harrow, with numerous fine teeth bent backward, which will cover the seeds the proper depth and contribute to fining and improving the surface. If dry weather is likely to follow the seeding, the roller should be used to insure the germination of the seed.

For those who may not have a roller, a very good substitute, called a dray, may be made of two-inch plank or flat split timber, in pieces four and a half feet long by ten or twelve inches broad, lapped and bolted together till the breadth is equal to the length. Such an implement will be found very useful on a farm as a clod-crusher and for smoothing the surface for other crops.

As meadows, when set, are intended to stand for a number of years, the best preparation to secure an even surface and a good stand of grass will well reward the labor required. In the spring, when the frost is well out of the ground, the roller may be advantageously used to press the ground well to the roots and smooth the surface.

The proper time for cutting the grass next claims our attention. On this part of the subject very erroneous opinions are held from which great loss occurs, both to the producer and consumer. It is claimed by some writers that timothy should be cut in the bloom. When put to the proper tests, this will be found to be a great mistake, reducing the value of the crop thus harvested and ruinous to the meadows, as I propose to show.

My attention was first called to this subject more than forty years ago, by a neighbor, who had a lot of fine colts that he desired to give the best care. To that end, he cut and carefully cured timothy in bloom, and put it in the colt stable loft for their winter food; but to his surprise the colts did not eat this carefully cured green hay freely, and rapidly became reduced in flesh. For this he was not able to account till sometime in the winter. He was hauling from stacks in the meadow, that had been cut at a more mature state for his work stock; the colts followed the wagon and ate the matured hay greedily. This showed him what was the matter. He commenced feeding the colts matured hay, which they ate freely and improved in condition.

I might give many similar illustrations, but propose to give a few, the truth of which every farmer may verify for himself. In cutting large meadows, we commence before the grass has reached the desired state of maturity, that we may be able to finish before it becomes much over ripe. At the commencement, three important facts may be observed: gum does *not* accumulate on the cutting blade, showing a lack of saccharine and starch, which are the nutritive elements. The horses are not inclined to bite at the grass; but as it advances to maturity, the gum increases on the blade and the horses bite at the grass, and in handling the hay in the meadow it will be found to be perceptibly heavier. To approach greater accuracy as to the loss by premature cutting, I measured two strips of meadow, side by side, where I found the grass most even, and cut the first strip the 24th of June. I found green weight of grass 70 lbs., and weight of cured hay 21 lbs. I cut the second strip twelve days later, the first formed heads being turned brown and the larger portion of the seed in the dough state. The green weight of hay was 61 lbs.; weight of cured hay, 30½ lbs. Here was a gain of 45 per cent. in twelve days increased maturity. I had not expected more than 15 or 20 per cent. A brief statement of the mode of growth and periodicity of condition of the plant will enable us to appreciate the difference in its value when cut at the different states of its maturity. The plant collects its food from the earth and air. The chief portion of nutritive elements come from the air. In the spring the plant develops a mass of blades.

The crude elements taken up from the earth pass up into the blades, where they combine with the elements of the air. It is by this union of the two classes of elements that they become vitalized and nutritive, and fitted for the progressive development of the plant, for the elements taken from the earth are unfit to form the organic tissues of the plant until combined with the elements of the air. It is the office of this mass of blades to assimilate the materials for the development of the seed-stalk. With the accomplishment of this work all the life and nutriment in this mass of blades have passed from them. Nothing is left but the skeleton which has disappeared at harvest.

In the development of the seed-stalk the nutritive elements contained in the blades undergo a change, the starchy saccharine quality is changed into celulose to form the cell tissue of the seed-stalk, and has become comparatively *non*-nutritive. This change may be understood by what takes place in the sap of the sugar maple. In the spring the elements which had been stored up in the tissues of the tree the previous year, for the reorganizing the tree with young branches and leaves, were rich in saccharine, which may be converted into sugar, but as the season approaches for putting forth buds a change gradually takes place. The sap cannot be made to granulate, but it will still make inferior molasses. A little later, when the buds begin to put forth, it will not make molasses. It is converted into cellular and has lost its nutritive quality, as the sap in the timothy blade changes in developing the seed-stock. It is after the stalk is developed with blades that the work of strong nutriment in its tissues again commences. From this period the work of the plant is divided to the formation of seed at the top and a part to prepare for its own development, which it does by forming a bulblet at the base of each stalk, the embryo of a new plant. Now, if this embryo plant is not formed there is an end to the life of the plant, for the roots of the old plant die annually, and from the bulblet, after a season of rest, springs a new plant, as from an onion set. Any farmer may go into his meadow in the fall or spring and pull a stubble when the ground is soft, and it will pull up the old dead roots, and if the bulblets spoken of had been properly matured, he will find a new plant has sprung from it, and the vigor of the new plant will be proportionate to the maturity of the bulb from which it sprung. But if the grass was cut before it formed, then he will find the dead roots, but no new plant. I have seen many well set timothy meadows much thinned out and feeble, and some entirely destroyed by premature cutting. It is claimed by the advocates of cutting the grass in the bloom, that after that period its chief increase is in non-nutritive woody fiber. This is a serious mistake, and the reverse of the truth. Timothy is an endogenous plant, and when in bloom has completed the formation of woody fiber, and its tissues are filled with unpalatable and non-nutritive sap, which is afterwards combined with the nutritive elements drawn from the air, as we have already shown.

It is well known that on our western plains, where there is little or no rain in the summer and fall, animals feed and fatten on the dried grass. In the process of curing, the less the hay is exposed to the vicissitudes of the weather, the better it is; and the proper time for cutting becomes an important feature in the calculation. When the grass is cut at the proper state of maturity, what is cut in the forenoon may safely be put up in the afternoon of the same day, if the weather is favorable for drying; while that cut at an earlier period requires a longer time to cure, consequently is more liable to be injured by the weather, and requires additional labor to secure it. With all the loss and injury attending the premature cutting of this grass we are unable to conceive a single compensating advantage. Most of our experienced farmers and feeders of hay understand the subject, (perhaps not to its full extent,) but it is surprising the number of both producers and consumers of hay that are led astray by vain theories that have no foundation in *facts*.

We have inquired of some of the most experienced stable keepers in St. Louis, in regard to their estimate of the relation of hay, cut before the seed is formed, as compared with that cut at a more matured state. They say they would make a difference of 10 to 15 per cent. in favor of the mature cut hay; while another class of purchasers (intelligent in many respects, but as green on this subject as the premature cut grass they buy) make an equal difference in favor of the green hay. We have seen many well-set meadows ruined in St. Louis county by this premature cutting.

From what has been stated, it will be perceived that I prefer to cut the grass when the larger portion of the seed is in the dough state, but when large meadows are to be harvested, I begin on the ripest portion of the meadow as soon as the bloom falls, that I may finish before the grass is over ripe; but it is better to cut it over than under ripe, both for value of the crop harvested and for the future crop. The truth of this statement every farmer may verify for himself, by weighing the hay cut at different states of maturity, and by giving his horses an opportunity of deciding which they prefer, and the effect on the future crop may be determined by comparing the condition of that portion of the meadow cut first with that cut last, at the next harvest. To keep our meadows even, that part of the meadow we cut last one year, we should cut first the next.

We need say but little in regard to curing hay, as most farmers appreciate the importance of prompt action in protecting it from exposure from dew and rain. At the commencement of harvest, that cut in the forenoon may be put up in cocks in the afternoon of the same day, but as it advances to maturity, what is cut in the forenoon may be taken to the stacks or sheds in the afternoon with safety. Here I cannot too strongly urge the preference of hay sheds to stacks.

The question with every farmer should be, which method will secure him the largest reward for his labor.

When we estimate the liability of the hay to be injured while the stack is in the process of being made and the waste on the outer surface of the best made stacks, and the still greater loss by imperfect stacking, and the exposure of the stack while being marketed, with the additional labor required, the saving will pay a large interest on the investment in hay sheds. The pitching of hay by hand is the severest labor in securing the hay. The use of the horse hay fork greatly relieves us of this labor, and it can be used with much greater convenience in the hay shed than in the stack. Cheap hay sheds may be made with thatched roofs, a method of which will be found at the close of this paper.

FALL TREATMENT OF THE MEADOW.

Immediately after harvest, stock may be turned on the meadow to consume any remnant of grass that may be left; but when the new plants begin to appear, the stock should be kept off the meadow till the plants are well established, the blades being necessary to the growth of the roots. Close pasturing in the early part of the fall will diminish the crop of the next season; but when the plants have become well established, say from the middle of October, when the ground is not wet, meadows may be pastured without injury until the end of the season; the tramping of the animals causing the root to take firm hold in the soil.

SPRING TREATMENT.

In the spring, dock and all other weeds should be carefully removed, and the roller used.

When a well-kept meadow shows signs of exhaustion, well-rotted manure may be used to great advantage. The best time to apply it is after harvest before the fall rains. If the hay is desired for market, care should be taken to avoid using manure that will introduce weeds or the seeds of other grasses.

I have omitted to speak of other grasses for meadow, because my experience with other grasses is limited, and because I consider timothy far the most valuable on most of our soils; not doubting but red-top or some other grasses may be profitably grown on some soils. On fields that are to be alternated with other crops, red clover (not strictly a grass, but a leguminous plant) may be grown for hay to advantage, to be fed on the farm, especially for colts, cattle and sheep, and as a valuable fertilizer of our lands. Hungarian grass may also be grown advantageously on a rich land as a nutritious hay for cattle—better for milch cows than timothy—but is not considered a safe feed for horses.

Cheap hay sheds may be made by erecting a roof on posts. If to be thatched with straw the roof should have a higher pitch than for shingles. The laths for a thatched roof, if sawed, should be one and a quarter inches or one and a half broad, but split poles will answer. The laths should be nailed on the rafters thirteen to fifteen inches apart, and sawed off even, to which gable boards, ten to twelve inches broad, are to be nailed. Rye straw is the proper material for the thatch. The rye should be threshed with a flail and kept straight. To prepare the straw for the thatch, it should be tied in bundles, three or four inches in diameter, the tie a few inches from the butts, except the bundles for the first course, which should be tied twenty inches from the butts and the heads chopped off. The straw should be sprinkled to make moist. Commence the thatch with the last named bundles, by placing the bundle on the second lath, close to the gable board with the tie above the lath, the butts resting on the first lath. Pass a portion of the straw (the thickness of the thumb) under the lath and bring it out above the lath and next to the gable board; then bring it down diagonally over the bundle and add additional straw from the bundle, give a twist, pass it under the lath as before, press the bundle to the gable board, draw the withe tight, bringing it above, strike the bundle over the lath with the closed hand or a wooden mallet to flatten it. Put the next bundle in place, pass the withe over it and under the lath as before, adding additional straw from each bundle, press the bundles close and flatten and proceed as before, adding additional straw from each bundle, close and flatten; proceed in like manner to the other gable, then crowd in the last bundle and fasten it. Go back and commence on the next lath, with the first named bundles, with the butts up, the heads extending over the first course, and proceed as before, course after course, until the comb is reached on both sides, and complete the work by binding handsful of straw over the comb, heads and butts alternately, to be held fast by split poles bolted to the rafters. Such a roof, well put on, is less liable to leak, and will last as long as shingles.

THE NECESSITY OF FOREST-CULTURE IN OUR STATE.

BY GEORGE W. HUSMANN.

This is a subject which may appear trite to some, for much has already been said and written upon it, but apparently with so little result that there seems to be no other resort but to agitate it constantly, and thus at last awaken our people to what they really need as much—provided they intend to make this their *home* in the *truer* sense of the word; as good dwellings, carefully cultivated fields, durable and good pastures, and a stock law.

Although our Legislature passed, as early as March, 1870, an "Act to encourage the growth of forest trees," which awards a premium of two dollars annually per acre, or two dollars annually for every quarter of a mile, planted no more than one rod apart with any kind of forest trees, except black locust, and cultivating the same for three years, and although farmers themselves should find it to their interest to plant—do we see any forest culture, or even care of the forest lands they already have? Far from it! We see, instead of this, wanton and inconsiderate destruction of what they already have, what kind nature, in her bounty, has provided them with. Our forests are disappearing under the relentless stroke of the wood-choppers' axe, who cares little whether he fells the old or the young, the young and growing sapling, or the the decaying and gnarled old tree.

And what are the consequences? The last two summers, unprecedented in their drought on our prairies, should teach a lesson to every observing mind. Our scorched meadows, our burnt up cornfields, our starving and shivering cattle, should be a solemn warning to every one who intends to draw his sustenance from mother earth. Will we never pause in our reckless course until it is too late? And have we not abundant proof in the greater abundance of rains along our streams, and in the wooded districts of our State, and consequently better crops, that the influence of timber is all-powerful in drawing rain? Every civilized country in Europe has systematic forest culture, and reaps the benefits therefrom. Only we Americans, the would-be greatest and most perfect nation on earth, trust with vain foolhardiness to our inexhaustible resources. Will we never get over this remnant of our squatter and pioneer days? Will we forever be moving, regardless of what we leave behind us; cut the timber from our land, and move further when we have exhausted it; taking crops from fields until they will not produce half crops, and then clear new ground instead of manuring and recuperating in time; nay, even move our stables when they get too full of manure, instead of taking it to our hungry fields. Let no one say I exaggerate. It is the bitter truth that there is but little stability and less forethought in most of our actions, and unless we pause in this reckless course, even this immense country we inhabit will be too small in a few decades, and the tide which now sweeps westward will be stayed and compelled to return. Why, then, can we not stop and build up a home worthy of the name, where we are; surround ourselves with the comforts of life when they are within easy reach, and instead of devastating our forests, take care of them by judicious thinning, and plant, where there are none, on our prairies?

Surely, every one must have felt the difference, traveling on a windy winter's day, on the open prairie, when he came to a belt of timber, how much warmer and more agreeable it was there. It seemed as if he had come to a different climate, or that the weather had suddenly changed, until, emerging on the open prairie again, he was reminded that only the friendly shelter had thus protected him. Should this not be a hint, too plain to be mistaken that he should have a friendly grove near his house, and also near his barnyard, to protect himself as well as his stock from the cold blasts of winter? Besides, the presence of trees would also draw the insect-destroying birds nearer to his field, and he would soon find a material difference in his crops of grain and fruit.

In a former paper in the Report of 1872, page 473, to which I here refer, I have already given a few plain directions for planting and cultivating young forest trees, as well as for preserving and judiciously thinning timber lands. I have also given an approximate idea of the profits which may be expected from a reasonable system of forest culture, and that no crops will pay better and bring more clear profit to the farmer than this. The last two seasons, with their terrible droughts on our prairies, devastating as they were upon some varieties, have shown conclusively what varieties can be best depended on for general culture on prairie soil. It is an old but true saying, that we learn most through our misfortunes, and the last season has certainly applied the most severe test that could be required. I will name a few that have withstood it without flinching, and which are therefore most to be recommended, commencing with deciduous and ending with evergreen trees.

The Catalpa (*Catalpa Syringæfolia*) stands, with me, at the head of the list. It is easily propagated from seed, grows very rapidly, and, with its spreading, round head, large leaves and handsome spikes of blossoms, is a very desirable shade and street tree. It is entirely free from the ravages of insects, borer-proof, and, as near as any tree can be so, cattle-proof also. Besides, its timber is very durable, and, as its roots go deep and are very fleshy, the drouth will not affect it. There are handsomer trees than the Catalpa, but none so hardy and free from all defects as this.

The Ailanthus (*Ailanthus glandulosa*), or Chinese Tree of Heaven, is by no means a desirable tree to plant near dwellings, on account of the disagreeable odor of its blossoms; but as it grows more rapidly than any other tree, and suckers freely from the roots or stump when cut down, it can be recommended as a timber tree, especially as its wood, though very light and brittle, is also very durable. It is easily propagated, either from seed or root cuttings, and has a natural tendency to grow straight and tall.

The Osage Orange (*Maclura*) is not only a valuable hedge plant, but also a most valuable and rapidly growing timber tree, if kept trimmed up. Its natural habit is to grow into a tree, and it makes the most durable posts in a very short time. Besides it is a very pretty shade tree, if properly pruned, free from insects, and withstands the drouth well. It is as durable as Cedar, and will grow readily from seeds as well as root cuttings.

All varieties of the Ash (*Fraxinus*) are excellent for timber, and grow well on our prairies, though somewhat subject to the attack of the borer, nor do they grow as rapidly as the foregoing. They are, however, fine trees for shade, and grow readily from seed.

These are the leading decidous trees I can recommend for forest culture on our prairies. All the varieties of the Maple, handsome and desirable as they are, are very much subject to sun-scald and the attacks of the borer. The same may be said of the Elms; and although I would still recommend them for ornamental planting, they are not profitable as timber trees.

Of *Evergreens*, for wind-breaks and belts, as well as for single specimens, the *Red Cedar* (*juniperus Virginiæ*), the *Scotch Pine* (*Pinus sylvestris*), *Austrian Pine* (*Pinus Austriaca*), and *White Pine* (*Pinus strobus*), can justly be recommended. They withstood the drouth splendidly, and grew rapidly, while I am sorry to say my old favorites, the Norway Spruce, Hemlock and Balsam Fir succumbed, and were very frequently killed by the drouth, as also the Arbor Vitæs. The cause of this, I think, is that they have a great many fine, fibrous surface roots, while the pines and cedars go deeper into the subsoil. As a protection from wind and cold, a belt of Red Cedar around the premises can hardly be excelled. They form a living screen from the cold blasts, the beauty and value of which can hardly be estimated. But for this purpose they should branch at the ground, planted four feet apart, and kept clipped into a conical wall, or rather a continuous pyramid.

Of course, evergreens do not grow as rapidly as deciduous trees, but not as slow as many think. The Cedar will readily gain, when once established, from one to two feet in height, and the Scotch Pine will average two to three feet. They can be purchased very cheap, twice transplanted, and from one to two feet high, in a great many nurseries; and I would not advise any of our farmers to choose any smaller nor larger stock. These, with careful planting and mulching, will nearly all grow and do well.

Therefore, my farming friends throughout the State, but especially on the prairies, if you want desirable homes, if you wish that your lands should increase in value, that you and your stock shall be protected from drouth in summer and cold in winter, *plant trees*. But if you want *them* to protect *you*, *you* must also protect *them*, and the most effectual means to do this, is a *stock law*. Keep your cattle inclosed instead of allowing them to ruin half the woods we now have, by browsing and breaking the young growth. The damage done annually by your stock to the timber in your neighborhood, amounts to about as much as the cattle are worth, and, besides, if you kept your stock inclosed you would need no fences for your other lands.

THE FUTURE OF GRAPE-GROWING IN THE WEST.

BY GEO. W. HUSMANN.

Grape growing in the West, and especially in our State, promising and lucrative as it was in its infancy, is at present under a cloud. The markets are flooded and glutted with cheap wines and low priced grapes, so low, indeed, that they will hardly pay the grower, and it has become a question of vital importance, which every grape-grower anxiously asks, "Will grape-growing and wine-making pay in the future?"

But it is not alone every grape-grower at present engaged in the business who is deeply interested in the solution of this problem: it is also of vast importance to the future prosperity of the State. It has been asserted, and justly, I believe, that there are more acres of land adapted to grape-growing in this State than in the whole of France, and as two-thirds of these lands can hardly be used for anything else, it is a very important problem for our statesmen also, provided they have the prosperity of the commonwealth really at heart. I will try to throw some light upon the subject by giving my views, whether right or wrong, and only hope they will lead to a general discussion of it.

But to counteract an evil, we must first know its cause. Let us, therefore, see what may be the cause or causes of the present depression in our grape and wine market. I believe them to be manifold, and will look into them in succession. They are:

1. A GENERAL CULTIVATION OF BUT A FEW VARIETIES.

The varieties now mostly cultivated are the Concord and Norton's Virginia. Far be it from me to run down these two valuable varieties. The first makes, if properly handled, perhaps the healthiest and most invigorating drink for the laborer to use, while the Norton is the best medicinal wine we have so far. But they do not suit *every* palate. The Concord as a market grape does not carry well. It has too tender a skin, and although of fair quality, clogs the palate too soon, while the Norton is no market grape at all.

2. IMPROPER HANDLING OF THE FRUIT.

In looking over our market, especially our country towns, we find grapes brought in in baskets, in large boxes, and tumbled in promiscuously, without picking out the decayed, unripe and dry berries, hauled over rough roads five to ten miles, bruised and almost beaten to a jelly before they reach the consumer. Is it surprising that such fruit will not bring a fair price? And many of our market grape-growers cannot even wait until their grapes are ripe, but bring them in before they are fairly colored. The public try them, and are disgusted with grapes for the next two weeks. I have often sold good Concords, carefully handled and well picked, at 5 and 6 cts. per pound when other Concords in market could not be sold at 3 cts.

3. IMPROPER HANDLING OF THE WINE.

This is one of the principal causes of low prices. So far, nearly every grape-grower has made his own wine, and although it is true that every one can make wine, yet there is an immense difference in its quality. Wine-making in its true sense, is an art, which, though governed by certain principles, has a different product to deal with in the same grape nearly every season. Many, even the greater part of our wine-makers, go to work blindfolded, and trust to change to befriend them. Without instruments to determine the sugar and acid in the must, without knowledge when their must has fermented enough and should be pressed, is it surprising that failures are the *rule* with them, and success the *exception?* Poor wine-makers, bad casks, poor cellars, are found everywhere, and poor wines are the natural consequence. These are offered at last at almost any price, are bought by the saloon keepers because they are cheap, and sold by them at enormous profits. As long as this continues, we cannot hope to see wine introduced as a general beverage, and supplant beer and whisky, which it would gradually do if good wine could be obtained everywhere at the same price per glass as beer.

4. IMPROPER SELECTION OF LOCALITY.

A notion prevailed among most of our grape-growers that they can grow them almost anywhere. While this is true in a certain sense of the word—as vines will grow and bear fruit almost anywhere—yet there is a wide difference in the product. Every farmer can grow grapes enough for family use, and even make a fair drinkable wine also for home consumption; but only certain localities will develop the greatest perfection in special varieties, and make the finest wine to be obtained from them.

5. IMPROPER CULTIVATION.

Many rushed into grape-growing on a large scale, planted from ten to twenty acres, with the idea that they could be managed as easily as so many acres of corn. When they grew up, they found it not so easy to take care of them; the vines grew out of their control, were sadly neglected, and of course could not yield a good product. They are not a paying investment, nor would any other crop be, neglected in the same manner. In a few years they will number with the "things that have been."

To counteract these causes of low prices and depression in the market of grapes and wine, what must we do?

1st. Each grape-grower should experiment for himself in his particular location, which of the newer varieties, either for market or for wine, will suit him best. We must throw the idea overboard after which so many have shaped their practice, that an *univrsal* grape could be found, which would succeed, and yield a first class product *everywhere.* We know already that the Herbemont will yield its finest product on poor limestone soils and southern slopes, while the Delaware in this State, where it does succeed at all, will do so only in sandy soil and northern slopes; and that the Rulander will make a fine cherry in one location, while it will make a choice hock in another.

We have an abundance of fine grapes already, which are eminently successful in some parts of the State, while they will not succeed in others. I will name a few of them which deserve universal trial, with such information as to the location they are best adapted to as I have been able to gather. As the general demand seems to be for a good white, or light-colored wine, I will name the white wine grapes first.

MARTHA

Seems to succeed well almost everywhere, like its parent the Concord. It is very generally planted around Hermann now, as it makes a white wine superior to the Catawba, if gathered *in time*, and not allowed to get over ripe, when the wine is too heavy and foxy, and produces a fair crop every year. It does not grow quite as rank as the Concord, and is even more hardy and healthy. It is also an attractive *market* grape.

HERBEMONT

Succeeds best on southern, rather warm, poor exposures, as on rich soil it is apt to make a late, rank growth, which will not ripen well. It is one of the most productive varieties in good locations, and if pressed soon after crushing, makes a very delicate *white* wine, but if allowed to ferment on the husks will also make a fine *red* wine. Its popularity is steadily increasing, and its wine always sells readily and at good prices.

GOETHE.

This is a noble grape for the table and market as well as for a light white wine. In some locations, it has been badly affected by the Phylloxera, especially in clay soils, while in the sandy soils around Warrensburg, it seems to be entirely free from it, and produced as heavy crops as the Concord last season, which ripened even better than that old standard. Whenever tried in the western part of the State, it has won golden opinions; but it, as well as nearly all other Roger's Hybrids, are very apt to overbear when young, being exceedingly productive, and they therefore need severe summer pruning and thinning out very early in the season. It ripens later than the Concord, and will always bring a high price in market, while its wine is, if properly made, perhaps the most sprightly and delicate Muscatel we now have, always selling higher than Catawba.

MASSASOIT.

The foregoing remarks as to soil, etc., may also be applied to this, the finest *early* grape we have. It is nearly as early as Hartford, of excellent quality and very productive; always brings the highest price in market on account of its beautiful color, earliness and superior quality, and makes up excellent white wine.

RULANDER.

Suited to the same soils as the Herbemont, but not as productive; but it makes up for this by the superior quality of its wine, which is one of the finest light-colored wines we have, very heavy, and with a peculiar Sherry flavor. The *Louisiana*, which closely resembles it, will make a superior hock wine, and whoever will grow these two varieties will always receive a high price for their wine.

HERMANN.

This has all the hardiness of its parent, the Norton's Virginia, and is even more productive and healthy. It makes an exquisite Sherry, brownish-yellow in color, of heavy body and fine flavor. Will succeed almost anywhere, and deserves far more general culture than it has received so far.

For red wine of the choicest kind, the *Cynthiana* has already a world-wide celebrity, having received the Golden Medal at the Vienna Exposition as best red wine. It succeeds nearly everywhere, is hardy, healthy and productive.

Among the newer varieties, which promise to be of high value, but have not been fully tested out of their own immediate locality, I will name the Elvira, Neosho and Lessing, all promising to be grand acquisitions to our wine grapes, and the Triumph, the finest table grape I have yet seen, and which also makes a fine wine.

2d. To handle grapes for market as they should be. Take only good bunches, evenly ripened; pick out all unripe, decayed and dried berries; handle very carefully and pack into small shallow boxes or baskets. They should be brought to market in the freshest and plumpest condition possible, not hauled over rough roads or jolted about. They will then bring double the price that poorly-handled and badly-ripened fruit will bring.

3d. Wine should be made only by those who thoroughly understand the business, and have all the facilities. A wine-maker, to reach the greatest perfection in his product, must be able to determine what his grapes contain, and also know what they ought to contain, what percentage of sugar, acid and flavor, and must assist nature where she has failed to do her part, by adding what may be wanting and diluting what may be in excess. He must know how to handle each variety during fermentation—when to press, when to rack and how to keep his vines. He must have the necessary casks, cellars, buildings, etc. All this takes capital combined with skill, and I do not expect to see uniformly good wines, until it is nearly all made in large quantities, by but a few in each locality, who have all the necessary appliances. Then only will they also command uniformly good prices; and the small grape-growers had better dispose of their crops to these establishments than attempt to make the wine themselves.

4th. It is the height of nonsense to suppose that any soil and location will produce grapes fit to make fine wines. We have abundance of good locations scattered all over the State, and need not choose the poor ones. There is an immense difference in the product of the same grapes on different soils, well known and appreciated in all grape-growing countries, and we cannot expect to be the only exception here. Peculiar localities will in time become as famous for their products of certain varieties as they are in the old world. We have a great deal to learn in that respect yet, and only time and careful experiments will finally determine this.

5th. We also want careful cultivation to give us the best product to work upon, and so develope the finest flavor in our grapes. We want proper cultivation of the soil at the proper time, a proper course of pruning, fall and summer, enough, yet not too much. In fact, to sum up, we want more intelligent labor, more experiments, more thinking and observing vintners, who know what they are doing, and why they do it. We may even have to resort to grafting, to successfully cultivate some of our more valuable varieties, the roots of which may suffer too much from the attacks of Phylloxera, on the roots of other varieties exempt from it. We can become one of the greatest wine-producing countries on the face of the earth, if we only strive faithfully for the goal. California, though growing abundance of grapes, can never compete with us in the *quality* of our wines. They are all too strong and fiery, and deficient in that fine flavor and boquet which distinguishes the finer wines of Europe, and also the best wines made here. To show what is thought of our wines already, I will quote from a letter received from Mr. Dougsset, at Montpellier, France, to whom I have just shipped 180,000 cuttings of our vines, and to whom I sent two boxes of wine, assorted, of fifteen varieties, made by Messrs. Poeschel & Scherer, Hermann. He writes:

"I duly received the two boxes of wines sent by you. They were exhibited by me before the International Congress of Viticulture just held at Montpellier, and tested by a committee of thirty members officially appointed for that purpose. They were about the best connoisseurs of France. Norton's Virginia and Cynthiana, as red wines; Martha, Goethe, and above all, Hermann and Rulander, were highly praised; and the general opinion is, that after we have restocked our vineyards with American vines, we will not regard the loss of our own very much. As to Concord, Ives, Wilder, North Carolina, Clinton, Herbemont and Cunningham, they will very likely become the wines for general consumption in our aramous and in our black soil."

If this is already the verdict abroad, should it not stimulate us to renewed exertions, and fill us with bright hopes for the future? Let us look forward to that good time, which is soon to come, of ready sales and good prices for first-class products. Let every one of our grape-growers do his share faithfully to bring these results about, and we may yet see Missouri the leading State in the Union in the product of her vineyards.

ERRATA.

Page 85, six lines from bottom, for "S. L. K. C. U. R. R." read "S. L., K. C. and N. R. R."
Page 35, five lines from bottom, for " G. M. & P. R. R." read " Q. M. & P. R. R."
Page 44, line eighteen from top, for " T. M. B. R." read " I. M. R. R."
Page 46, third line from bottom, for " which" read " whom."
Page 54, eleventh line from top, for " county " read " country."
Page 62, seventh line from top, for " 1864 " read " 1874."
Page 155, eleventh line from top, for " 4,247 " read " 11,247."
Page 170, thirteen lines from bottom, for " northwestern " read " northeastern."
Page 194, second line from top, for "deny " read " buy."
Page 238, tenth line from top, for " change " read " chance."
Page 229, fifth line from bottom, for "dray " read "drag."

NOTICE.

First—By mistake, the name of the author of the article headed "Live Stock Interests of Missouri" has been omitted. The article is one which required much study. It is ably prepared and reflects much credit on its author, Mr. Thos. Turner, of St. Louis county.

Second—Under the head of "Classification of Contents" is found "Proceedings of the State Horticultural Society—1874." The Secretary of said Society has not furnished these Proceedings, as by law required, and it is deemed best not to delay publishing the rest of the Report waiting for said "Proceedings."

Third—The little map given in this Report is very meagre. It is, as far as it goes, correct, and proposes to represent the position, general shape and comparative size of the several counties; also, the rivers and railways of the State. The sparseness on the map of towns, and villages in the counties—especially in those counties lying generally in the southern part of the State—may give an improper idea of these counties in that respect. In referring to the "little histories" of each county given in this Report will be found the census of said county for 1870, and the reader can form some general idea of the population for 1874, and its consequent towns and villages.

Very respectfully,

JOHN S. MARMADUKE, *Secretary.*

GENERAL INDEX.

A.

PAGE

Agriculture: State Board of—publication of report........ 5
Agricultural and Mechanical Societies........ 6
Acts of 1867 concerning same........ 6
Annual Report of the Corresponding Secretary........ 29
Appropriations: Board of Agriculture........ 6

B.

Broom Corn, by D. M. Frost........ 210 to 215
  Kind of soil requisite........ 210, 211
  Harvest........ 211, 212
  In fields........ 212
  In sheds........ 212
  Duty of breaker........ 212
  Duty of cutter........ 212
  Duty of binders........ 212
  Duty of loader and wagoner........ 212
  Duty of bunchers........ 213
  Duty of the thresher........ 213
  The carrier........ 213
  The spreader........ 213
  The seed hauler........ 213
  Bailing........ 213
  General observations........ 214, 215

C.

Classification of contents of Report........ 3
Comparative figures........ 185, 186
County Agricultural and Mechanical Societies........ 6
Corresponding Secretary's Report........ 29
Corresponding Secretary, Report of........ 31

E.

Errata........ 242

F.

PAGE

- Forest culture in our State, by George W. Husmann.... 234 to 236
  - Necessity of.... 234
  - Law concerning.... 234
  - What are the consequences.... 234
  - Neglect of Americans to plant forest trees.... 234
  - Protection from growth of forest trees—benefit of.... 235
  - Kinds suggested.... 235
    - Catalpa.... 235
    - Ailanthus.... 235
    - Osage Orange.... 235
    - Ash.... 235
    - Evergreens for wind-breaks and belts.... 236
      - How to plant.... 236

H.

- History of counties.... 35 to 161

I.

- Immigration, tide of—why it has ceased to flow to the United States and to Missouri.... 19, 20, 21
- Introduction.... 33, 34, 35

L.

- Laws concerning State Board of Agriculture and County Agricultural and Mechanical Societies.... 4, 5, 6, 7, 8, 9
- Live Stock Interests of Missouri, by Thos. T. Turner, of St. Louis county.... 166 to 186
  - Missouri unites all the desirable requisites for successful stock-raising.... 167
  - The farmer to compare his experience with that of others.... 167
  - Texas steers and rail-splitting porkers not to be brought into competition with sleek Short horn bullocks and Berkshire swine—corn will not produce these results.... 167
  - Difference of opinion among breeders of improved animals as to which kind is suited to each locality.... 167
  - Objections urged against fancy stock.... 167
    - 1st. They are too high-priced.... 167
    - 2d. They are too delicate, and need too much attention.... 167
    - 3d. They are only an improvement on the native, and that good feed and attentive breeding will accomplish what has already been done.. 167, 168
  - Objections answered.... 167, 168
  - Many farmers obtain their first insight into stock-raising at agricultural fairs.. 168
  - The right place to examine improved stock is in the field or the barn.... 168
  - Making a breed and bringing it to perfection are two difficult and different things.... 169
  - Estimating the advantages of stock-raising.... 170
  - Horses.... 171 to 174
    - The Thoroughbred or English blood.... 171
    - The Trotter.... 171, 172

PAGE
Live Stock—Draft horses—Percherons........ 172, 173
    Clydesdales........ 173
    Suffolk Punches........ 173, 174
  Hogs........181 to 186
    The Berkshire........ 181, 182
    The Poland China or Moore........ 182, 183
    Chester Whites........ 183
    The Yorkshire........ 183
    Suffolks........ 183
    The Essex........ 183, 184
    Soiling or pasturing........ 184, 185
  Cattle........174 to 177
    Beef breeds........ 174
    The Short Horns........ 174, 175
    Herefords........ 175
    Devons........ 175
    Dairy breeds........ 175
    The Holstein or Dutch cow........ 175, 176
    Ayershires........ 176
    Jerseys or Alderneys........ 176, 177
    Swiss........ 177
  Sheep........177, 181
    The Merinos........177, 178
    Long Wools........ 178
    Cotswolds........ 178
    The Leicesters........178, 179
    The Lincolns........ 179
    (New Oxfords or improved Cotswolds)........ 179
    South-downs........ 179, 180
    Shropshire-downs........ 180
    Hampshire-downs........ 181
    Oxfordshire-downs........ 181

M.

Map of Missouri, prepared for the State Board of Agriculture, and to illustrate the Article on "Rocky Mountain Locust," by Chas. V. Riley........between 32 and 33
Meadows and Hay-making........229, 233
    Fall treatment........ 232
    Spring treatment 232, 233
Meeting of New Board, Prof. John H. Tice, Recording Secretary........24, 25, 26, 27
Members of the Board for 1874........ 10
Members of the Board for 1875........ 10
Missouri, length and breath, latitude, number of square miles and number of acres; when purchased of France; when admitted as a State into the Union........34, 35

N.

New Board, meeting of........ 25
Note—Letters giving information concerning counties........31, 32

P.

PAGE

- Practical suggestions concerning seeds ... 223 to 228
  - Definition of seed ... 223
  - Influence by soil, heat or moisture ... 223
  - Most important seeds for our State ... 223
  - Certain seeds brought from other localities will not exhibit here the same characteristics ... 223
  - Farmers should depend on themselves for obtaining seed grains of hemp and tobacco ... 224
  - Suggestions as to selection ... 224
  - Each locality should produce its own seeds for general farm crops ... 224
  - Vegetable seeds ... 224 to 228
    - Economic value overlooked by our large farmers ... 224, 225
    - Most vegetable seeds used in our State grown elsewhere ... 225
    - The question as to obtaining perfect seed—suggestions ... 225
    - How to send for seed ... 226
    - Every farmer should save his own seed—some hints in selecting ... 226
    - Gathering of seeds should not unnecessarily be delayed—how to proceed ... 227
    - Business of a first-class seedsman ... 227, 228

R.

- Report of Corresponding Secretary, John S. Marmaduke ... 31, 32
- Report of Professor Tice, Recording Secretary ... 13, 14, 15

S.

- State Board of Agriculture and County Agricultural and Mechanical Societies—laws concerning ... 4, 5, 6, 7, 8, 9
- State Board of Agriculture—Proceedings of, at its Annual Meeting in December, 1874 ... 11 to 24

T.

- Table—Number and value of live stock in Missouri as compared with other States ... bet. 186 and 187
- Table showing population, enumeration, enrollment, district, number of school houses, number of school houses built during the year, total valuation, number of public and private schools and number of teachers ... 162, 163, 164, 165
- The Tide of Immigration—why it has ceased to flow to the United States and to Missouri ... 19, 20, 21
- The Future of Grape-growing in the West, by Geo. W. Husmann ... 237 to 241
  - A general cultivation of a few varieties ... 237
  - Improper handling of the fruit ... 237
  - Improper handling of the wine ... 238
  - Improper selection of locality ... 238
  - Improper cultivation ... 238
  - Martha ... 239
  - Herbemont ... 239
  - Goethe ... 239
  - Massasoit ... 239

PAGE
Grape-Growing—Rulander 239
Hermann 240
Tice's Report (as Recording Secretary) of the Proceedings of the State Board of Agriculture, at its Annual Meeting in December, 1874 11 to 24
To the General Assembly of the State of Missouri—Introduction 2
To the President and Members of the State Board of Agriculture—Introduction to Corresponding Secretary's Report 31
Tobacco Culture, by T. T. Settle 216 to 222
The plant-bed the foundation of the crop 216
Selection of ground for plant-beds 216
Kind of seed to be sown; varieties 217
Time to sow seed, January, February and March 217
Preparation of the ground for planting—manner of 217, 218
Transplanting plants—process of 218
Topping, pinching out the bud of the plant causes it to spread and mature; should be postponed as long as possible 218, 219
Suckers and horn-worms; how to dispose of them 219
When to cut, and how 219
Care to be taken to prevent sun-burn 219
When to haul, and how 220
Process of curing—flue-curing 220, 221
Climate of Missouri well adapted to the production of fine and high-priced varieties 220
Stripping, assorting and prizing 221, 222
Transportation, by W. C. Flagg 187 to 209
Causes of 187
Forces employed 187
Monopolies in 188
The great Northwest 188 to 192
Fertility of 188
Wheat production in 189
Corn production 189
Products, how transported 189
Passenger transportation 191 to 195
First cost of 191
Charges made 191
Comparison of costs with charges 191, 192
List of agreed rates from St. Louis 192
Distances exceeding 2,000 miles 192
between 1,000 and 2,000 miles 192
500 and 1,000 miles 192
under 500 miles 192
Result of Government aid to Central and Union Pacific railways 192
Table from London *Quarterly Review* for April, 1873 192, 193
Amount received by railways for passenger fares in United States in 1873 194
Charges and cost of transporting freight 194, 195, 196
Amount of railway charges for freight in 1873 174
Estimated value of commodities moved 194
Cost of transportation 194

PAGE
Cost and Charges—Railways—Lowest charges for transportation........194, 195
    Table showing profits of roads........195
  Water transportation for freights........196, 197
    Possibilities of........196
    Average length of season of navigation........196
    Competition not free........196
    Cost of........197
  Concentrated products preferable........197, 198
    Cheap transportation—how can it be obtained........198
  Serious error in our modern political economy........198, 199, 200
  Fraternalism........200 to 203
    Relations of railroads to Governments........200, 201, 203
  Railways are the highways of our modern civilization........203, 204
  If railways are public highways........204, 205
  Let each region manage its own affairs in its own way........204, 205
    Railroads should be controlled by the authorities of the counties in which they lie........205
  What had better be done........205, 206
    Relief, how possible........206
  Necessity for national railways........206, 207
    East and West lines of railways to carry migration........207
    North and South lines of railways are needed to exchange the great variety of products produced in one region and not in another........207
  Proposed government highways........207, 208, 209
    Water transportation a difficult question to deal with in the future........209
    Waterways are public highways, and should be made, as nearly as possible, free highways........209
    Public benefit is to be sought in the mutual interchange of the diversified products of our country........209
    Equal rights for all men. Our public highways should not be used to tax the people for the profit of private individuals........209
Treasurer's Report of Receipts and Disbursements for fiscal year of 1874........16

INDEX

TO

HISTORY OF COUNTIES.

A.

PAGE
Adair county, report of 35
Andrew county, report of 36
Atchison county, report of 37
Audrain county, report of 38

B.

Barry county, report of 39
Barton county, report of 40
Bates county, report of 41
Benton county, report of 42
Bollinger county, report of 43
Boone county, report of 44, 45
Buchanan county, report of 45, 46
Butler county, report of 47

C.

Caldwell county, report of 48, 49
Callaway county, report of 49, 50
Camden county, report of 50, 51
Cape Girardeau county, report of 51, 52
Carroll county, report of 53, 54
Carter county, report of 54, 55
Cass county, report of 55, 56
Cedar county, report of 56, 57
Chariton county, report of 57, 58
Christian county, report of 58, 59
Clark county, report of 59, 60
Clay county, report of 60, 61
Clinton county, report of 61, 62

PAGE
Cole county, report of....63, 64
Cooper county, report of....64, 65
Crawford county, report of....65, 66

D.

Dade county, report of.... 67
Dallas county, report of.... 68
Daviess county, report of....69, 70
DeKalb county, report of....70, 71
Dent county, report of....71, 72
Douglas county, report of....72, 73
Dunklin county, report of....73, 74

F.

Franklin county, report of....74, 75

G.

Gasconade county, report of....75, 76, 77
Gentry county, report of....77, 78
Greene county, report of....78, 79
Grundy county, report of.... 80

H.

Harrison county, report of....81, 82
Henry county, report of....82, 83
Hickory county, report of....83, 84
Holt county, report of....84, 85
Howard county, report of....85, 86
Howell county, report of....86, 87

I.

Iron county, report of....88, 89

J.

Jackson county, report of....89, 90
Jasper county, report of....90, 91
Jefferson county, report of....92, 93
Johnson county, report of....93, 94

K.

Knox county, report of....94, 95

L.

Laclede county, report of....95, 96
Lafayette county, report of....97, 98
Lawrence county, report of....98, 99
Lewis county, report of....99, 100

PAGE
Linn county, report of..........101, 102
Livingston county, report of..........102, 103

M.

Macon county, report of..........103, 104
Madison county, report of..........104, 105
Maries county, report of..........105, 106
Marion county, report of..........106, 107
McDonald county, report of.......... 108
Mercer county, report of.......... 109
Miller county, report of..........110, 111
Mississippi county, report of..........111, 112
Moniteau county, report of..........112, 113
Monroe county, report of..........113, 114
Morgan county, report of..........115, 116

N.

New Madrid county, report of..........117, 118
Newton county, report of..........118, 119
Nodaway county, report of,..........119, 120

O.

Oregon county, report of..........120, 121
Osage county, report of..........121, 122
Ozark county, report of..........122, 123

P.

Pemiscot county, report of..........123, 124
Perry county, report of..........124, 125
Pettis county, report of..........125, 126
Phelps county, report of..........127, 128
Platte county, report of..........129, 130
Polk county, report of.......... 131
Pulaski county, report of.......... 132
Putnam county, report of..........132, 133

R.

Ralls county, report of..........133, 134
Randolph county, report of..........134, 135
Ray county, report of..........135, 136
Reynolds county, report of..........136, 137
Ripley county, report of..........137, 138

S.

St. Charles county, report of..........138, 139, 140
St. Clair county, report of..........140, 141
St. Francois county, report of..........141, 142

PAGE
Ste. Genevieve county, report of....142, 143
St. Louis county, report of....143, 144
Saline county, report of....144, 145
Schuyler county, report of....145, 146
Scotland county, report of....146, 147
Scott county, report of....147, 148
Shannon county, report of....148
Shelby county, report of....149
Stoddard county, report of....150
Stone county, report of....151
Sullivan county, report of....151, 152

T.

Taney county, report of....152, 153
Texas county, report of....153, 154

V.

Vernon county, report of....154, 155

W.

Warren county, report of....155, 156
Washington county, report of....156, 157
Wayne county, report of....157, 158
Webster county, report of....158, 159
Worth county, report of....159, 160
Wright county, report of....160, 161

SEVENTH ANNUAL REPORT

ON THE

NOXIOUS, BENEFICIAL,

AND OTHER

INSECTS

OF THE

STATE OF MISSOURI,

MADE TO THE STATE BOARD OF AGRICULTURE, PURSUANT TO AN APPROPRIATION FOR THIS PURPOSE FROM THE LEGISLATURE OF THE STATE.

BY CHARLES V. RILEY,
State Entomologist.

JEFFERSON CITY:
REGAN & CARTER, STATE PRINTERS AND BINDERS.
1875.

Entered according to act of Congress, in the year 1875, by CHARLES V. RILEY, in the office of the Librarian of Congress, at Washington.

PREFACE.

To the President and Members of the Missouri State Board of Agriculture:

GENTLEMEN: The following pages constitute my Seventh Annual Report on the Noxious, Beneficial and other Insects of the State of Missouri.

As its contents show, the year 1874 has been remarkable for the wide-spread suffering that insects injurious to Agriculture have entailed, especially in the Mississippi Valley and the country to the West. Our own State, though not suffering so much as some of her sister States, did not escape immense injury. Added to a severe drouth, which shortened most crops, our farmers suffered much more than usual from the ravages of the Chinch Bug; while in the western counties they also suffered from the visitations of the Rocky Mountain Locust, or so-called "Grasshopper," which spread such desolation over so large a portion of the fair West. Both these insects receive that large share of attention in the present Report which their importance and the interest just now attaching to them demand. Still a third insect, namely, the Flat-headed Apple-tree Borer, has been unprecedentedly abundant and injurious to our fruit and shade trees, and it gives me pleasure to lay before the people some new facts which will help to a better mastery of it.

A law passed by the last Legislature not only changes somewhat the mode of binding and distributing the Agricultural Report, of which this forms a part, but increases the edition from six to twelve thousand, and limits the number of pages it shall contain to 500. Finding that the articles on the noxious insects, of which this Report treats, occupy more than the ordinary number of pages allotted to me, I have deviated somewhat from previous custom, and omitted the chapters on Beneficial and Innoxious Insects, with which its predecessors have ended. In the article on the Rocky Mountain Locust, the reasons are given at length why I believe that this plague will never do serious harm beyond a certain line there indicated. It gave me no small satisfaction to be able to allay last Fall the fears our farmers east of that line entertained of being overrun by the pests. For some years past, Kansas, by one means and another, and especially by a liberal policy on the part of her Legislature toward her State Horticultural Society, has done all in her power to attract immigration. Our own State government has repeatedly refused the appeal of our State Horticultural Society for small appropriations to enable it to exhibit the fruits and advertise the resources and capabilities of the State; and other measures intended to encourage immigration have been left without support. The consequence of such legislative neglect, and of other less avoidable occurrences, was seen in the trains of emigrant wagons that during the last two or three years have been passing through our State, bound for Kansas or some more western point. The locust invasion of 1874 checked the tide of emigration to Kansas and the further West, and even turned it back again; and I have every reason to believe that the assurance that Missouri is essentially safe from the devastations of these locusts will have no inconsiderable influence in staying that immigration within our borders in the future.

There yet are, and doubtless ever will be, those who—dwelling in cities, and familiar only with such lectularious insects as cause them bodily inconvenience—have little appreciation of Agriculture or of Entomology in its connection with it; and consider the study of "bugs," as they contemptibly call everything that creeps, a fit subject for ridicule. When, however, a single insect, like the Chinch Bug, filches nineteen million dollars, in a single year, from the pockets of the farmers, and reduces in so much the wealth of the State; even such persons may be brought to admit that any study having for object the reduction of this immense loss, is not necessarily contemptible, small as the objects may be with which it deals. Fortunately, such persons are becoming fewer and fewer, and the following pages bear witness to the fact that not only in several States in our Union, but in several countries of the "Old World"—in monarchies, empires and republics alike—the authorities have manifested a remarkable appreciation of economic Entomology. We have, during the year, witnessed Australia and New Zealand discussing and attempting the introduction from Europe of Aphis parasites to check the alarming increase of those plant pests; and of bumble bees to enable the farmers to grow their own clover seed. We have seen France increasing her premium for a Phylloxera remedy to three hundred thousand francs, and considering plans, for the destruction of the pest, of constructing an irrigation canal to supply 60,000 acres. We have seen Massachusetts memoralizing her Legislature to pass "An act for the destruction of Insects Injurious to Vegetation;" while some of our own State Legislatures have been convened in special session to consider means of relieving the sufferers from insect ravages, and several European governments have, with forethought and wisdom, taken such measures as seemed best to prevent future injury from still other insect pests.

The fact that the Agriculture of the United States is of equal material importance with all the other interests of the country combined is so often asserted and admitted that it needs no enforcing. This industry not only feeds our own forty million mouths, but supplies the staff of life to millions in foreign lands. Surely, then, it is most important to study and investigate those causes which affect it injuriously and arrest its development, among which injurious insects play such an active part. When, as last year, the prosperity of whole States is jeopardized, and the whole nation suffers most sensibly from these depredators, national measures should be taken to investigate the causes and endeavor to prevent the recurrence of such disasters in the future. I have already referred to the immense loss which the Chinch Bug caused us last year, my estimates being based on returns obtained from farmers from the different counties. Yet, though the sum demonstrably amounts to millions, many of our legislators and some of our journalists would laugh at me were I to ask for an appropriation of five or ten thousand dollars to be expended in experiments which might result in giving us a perfect, or at least a much better remedy for the evil than any now in our possession, and thus save the whole or the larger part of this immense annual loss. Experiments on a sufficiently thorough and extensive scale can never be undertaken by the few State entomologists now employed, with salaries of two or three thousand dollars, from which they pay their expenses. The means will not justify them and the time of such officers is occupied with the study of not one or two, but of hundreds of species, many of them local in character. In cases, as with the Locust, the Chinch Bug, the Cotton Worm, etc., where the evils are of a national character, a national Commission, appointed for the express purpose of their investigation, and consisting of competent entomologists, botanists and chemists, is necessary, and should be demanded; and I am glad that preliminary steps have been taken by some of our leading scientific men to memoralize Congress to create such a Commission, the members to be chosen by the Council of the National Academy of Science, and approved by the Secretary of the Treasury.

We have, it is true, a Department of Agriculture which, if under intelligent and scientific control, might employ the large sums it now fritters away in the gratuitous distribution of seeds, to better advantage in organizing and sending out such a Commission; but the people have lost all hope of getting much good out of that institution as at present organized, or so long as the character of its head and management depends on political whim or fancy.

I have referred in previous years to the binding and distribution of the Entomological Report, and suggested that improvements might be made in the law. In some respects the new law, already referred to, is a great improvement on the old one, and will have a tendency to bring these reports before the farmers, in a manner in which they have not been brought before them in past years, if we may judge from the experience of the many whose letters I partly publish in the Chinch Bug Appendix. My 6th Report was published last April, and a word or two as to its distribution may not be out of place. At the approach of Summer it began to be rumored, and it finally became manifest, that your late Corresponding Secretary, Mr. J. F. Wielandy, decided not to publish a report. As mine is bound in by law with that of your secretary, and I did not wish it to lay the whole year at the bindery, I took measures to have it bound and distributed separately, and, after conferring with the Governor and Secretary of State, and the officers of the Board, and getting the sanction of my intended course from each individual member of the Board, it was so ordered bound and distributed.

At the request of a committee appointed by the Board of Curators of our State University to confer with me on the subject, I agreed a year ago to prepare a collection of insects for the use of the Agricultural Department of that Institution. During the year I have devoted what little time I could spare, and all the time of an assistant, Mr. Lugger, not absolutely needed in other directions, to the preparation of this cabinet, which I took to Columbia last December, and delivered to the College. It consists of sixty drawers, 12 by 16 inches, with a depth of 2½ inches inside, and lined with cork and ruled paper—the drawers being of pine wood with cedar fronts, and the cabinet itself being of oiled walnut. It contains types of the principal insects of the State, with figures, in many instances, of their adolescent stages. These insects are all carefully mounted and properly classified, with printed, ordinal, family, generic and specific names attached, and where the species have been treated of in my Reports, there are references made to the particular Report and the particular figure. The whole forms a type collection intended for the instruction of the students, and to illustrate my lectures before the entomological class at the University; and in each drawer there is room left for the addition of specimens that may be collected by the students.

In these busy, stirring days, there are few men who get time to read through a Report on any specialty—even among those for whom such a report is more particularly intended. In the work herewith submitted there will be found matter that will interest the scientific as well as the practical man; and, fully appreciating the truth of the aphorism, *Ars longa, vita brevis est*, I have endeavored to so arrange and sub-divide the matter that the reader may refer at once to that which more especially interests and concerns him. In a work intended for future reference as well as present use, the topics are best discussed under as many sub-heads as possible.

In this, as in the previous volumes, when the insects treated of are new, or the existing descriptions of them are imperfect, or in a foreign language, or in works out of print or difficult of access, I have added a full description, which is, however, always printed in smaller type, so that it can be skipped by the non-interested reader. The popular name of each insect is accompanied by the scientific name, and the latter is generally printed in *italics* and mostly in parenthesis, so that it may be skipped by the practical man without interfering with the text. The Order and Family to which each insect belongs, are also given under each heading. The dimensions are expressed in inches and the fractional parts of an inch, and the sign ♂ wherever used, is an abbreviation for the word "male," the sign ♀ for "female," and the sign ☿ for neuter.

Many of the figures are enlarged, but the natural size of each of such is also given or indicated by a hair-line, except in the representation of enlarged stuctural details, where they are connected with the life-sized insect to which they belong.

The name of the author of the species, and not of the genus, is given as authority; and in order to indicate whether or not the insect was originally described under the generic name which it bears, I have adopted the following plan: When the specific name is coupled with the generic name under which it was first published, the describer's name is attached without a comma—thus indicating the authorship of the dual name: e. g. *Phycita nebulo* Walsh. But when a different generic name is employed than that under which the insect was first described, the authorship is enclosed in parenthesis, thus—*Acrobasis nebulo* (Walsh); except where the whole name is already in parenthesis, when a comma will be used for the same purpose: e. g., (*Acrobasis nebulo*, Walsh).

All the illustrations, except Fig. 30, unless otherwise stated, are drawn by myself from nature.

My office is still at Room 42, St. Louis Insurance Building, N. W. Corner of Sixth and Locust Sts., where all communications should be sent. I regret not to be able to thank the officers of our different railroad companies for courtesies extended on their different lines. The stringent regulations which the roads have adopted have prevented my obtaining the passes which in former years materially assisted in the prosecution of my work.

Respectfully submitted,

CHARLES V. RILEY,

State Entomologist.

ST. LOUIS, MO., April 1st, 1875.

TABLE OF CONTENTS.

PREFACE.. III

NOXIOUS INSECTS.

THE COLORADO POTATO-BEETLE.. 1

It reaches the Atlantic—Injuries during the Year—Alarm about it Abroad—Is it Poisonous?—The Use of Paris Green and its Influence on the Plant, on the Soil and on Man—The Beetle eats as well as the Larva—It passes the Winter in the Beetle State—New Food-plants—New Means of Destruction—The proper scientific Name of the Beetle.

THE CHINCH BUG.. 19

Appearance and Transformations of the Chinch Bug—Descriptive—Past History of the Chinch Bug—Its past History in Missouri—Destructive Powers of the Chinch Bug—Its Injuries in 1874—Its Injuries in Missouri in 1874—Its Food-plants—Mode of Reproduction and Hibernation—Where the Eggs are laid—Flight of the Chinch Bug—Its Migration on Foot—Heavy Rains destructive to the Chinch Bug—Direct Remedies—Preventive Measures; as invigorating the Plant by Manure; early sowing; preventing the Migration of the Bugs from one Field to another; abstaining from the cultivation of the Grains upon which it feeds—Importance of Winter Work—Natural Enemies—Possible remedial and preventive Measures that need further Trial—Injurious to Stock—Prognosticating—Unnecessary Fears—Bogus Chinch Bugs—Recapitulation—*Appendix*, giving abstracts of the Experience of Correspondents from all parts of the State.

THE FLAT-HEADED APPLE-TREE BORER.. 71

Its Natural History—Natural Enemies—Remedies.

CANKER-WORMS.. 80

Showing how two distinct Species have been confounded; how we have a Spring and a Fall Canker-worm—Their Differences fully set forth in all Stages—Comparative Descriptions of the Two—Practical Considerations growing out of the Differences in Habit—Extracts from the original Essay on the Canker-worm by Wm. Dandridge Peck, published in 1795.

THE GRAPE PHYLLOXERA.. 90

Completion of its Natural History—Different Forms presented by the Species—Specific Identity of the Root-inhabitating and Leaf-inhabiting Types—Where do the winged Females lay their Eggs?—The sexual Individuals—Injury done during the Year in America—Range of the Insect in America—Injury during the Year in France—Spread in Europe—Direct Remedies—Natural Enemies—Susceptibility of different Varieties—Grafting as a Means of counteracting the Work of Phylloxera; Roots to use as Stock; Varieties to graft—American Grape-vines Abroad—*Appendix*, giving a Synopsis of American Species of the Genus Phylloxera, and the Natural History and Diagnosis of the American Oak Phylloxera.

THE ROCKY MOUNTAIN LOCUST........ 121

Its Natural History—Where the Eggs are laid by Preference—The migratory Instinct and great destructive Power belong to but one Species west of the Mississippi—Easily confounded with the Red-legged Locust—Descriptive—Chronological History—The Invasion of 1873—The Invasion of 1874; each State and Territory considered separately—Its Flight and Ravages—Food-plants—Time of Appearance—Its native Home; it cannot thrive in the Mississippi Valley, and can never reach far into Missouri—What Injury may be expected in Missouri in 1875—Ravages of migratory Locusts in the Atlantic States—Injury from other, non-migratory Locusts—Enemies and Parasites—Remedies—Preventive Measures—Suggestions that may prove of Value—Nomenclature—*Appendix*, giving the Experience of a few Correspondents.

NOXIOUS INSECTS.

THE COLORADO POTATO BEETLE—*Doryphora 10-lineata* Say.

(Ord. COLEOPTERA; Fam. CHRYSOMELIDÆ.)

IT REACHES THE ATLANTIC.

After narrating, in 1868,* how this insect had made its way from the Rocky Mountains, where it originally fed on the wild *Solanum rostratum* Dunal, till, in 1859, it reached a point one hundred miles west of Omaha, Neb.; how, in 1861, it invaded Iowa, in 1862, Southwest Wisconsin, and in 1864 and 1865, crossed the Mississippi to the western part of Illinois and eastern part of North Missouri; how, in 1866, it occupied most of the country west of a line drawn between Chicago and St. Louis; how, in 1867, it reached Southwest Michigan and West Indiana; and, finally, how, in 1868, it was already announced in portions of Ohio—I showed that its average annual progress eastward had been upward of seventy miles, and predicted that it would probably reach the Atlantic about A.D. 1878, or a few years earlier than Mr. Walsh had calculated some years previously, when he first traced its eastern progress and showed that it was traveling onward to the Atlantic, establishing a permanent colony wherever it went. In subsequent reports, its progress eastward was yearly recorded, and I now have to record that it reached the Atlantic at many points during the year 1874, or four years in advance of the time predicted—the increased average annual rate being due no doubt to the aid the beetles got in their onward course from ships on the lakes and from the cars on our railroads.

Early in the summer, I received undoubted evidence of its appearance on the Atlantic seabord, and it was reported during the year from several parts of Connecticut, New Jersey, New York, Pennsylvania, Delaware, Maryland and Virginia.*

---

*First Report, pp. 102-3.

INJURIES DURING THE YEAR.

While the insect has been quite injurious in some of the Eastern States more recently invaded, it has attracted less attention than usual during the year in Missouri; for our farmers have come to consider it a necessary evil, and its destruction a part of potato culture. One rather curious circumstance in this connection relates to its increased injuries in its native home in the Rocky Mountains. It is a fact observed by many western travelers that the potatoes in the mountain regions of Colorado were less affected by the insect than were those of the Mississippi Valley. This was natural enough, since the wild food plants are common there, and the potato fields fewer and more scattered than further east; and, moreover, the stream which first branched off from the wild Solanum feeders, and took to feeding upon the cultivated potato and spreading eastward, doubtless took no backward course. During the past summer, however, the insect did great damage to the crops in the mountain region: yet a fact which is suggestive to the people in the Alleghanies is worthy of mention, and that is that while the injury reached three or four miles into the mountains, or to about the middle elevations (say 8,000 feet above the sea level,) the crop was entirely free from the insects above that altitude and yielded abundantly. This fact was communicated to me by several independent observers, and among others by Prof. J. H. Tice, who spent the summer at Left Hand Canon. Some observations of Mr. G. H. French, of Irvington, Ills., who also spent the summer in the mountains, to the effect that while he often found the bodies and eggs

---

*The following reports are the most trustworthy (the species having been identified in each instance) from among many others that might be given: The *American Farmer*, Baltimore, for July, 1874, says: "Not only in the vicinity of Baltimore, but all over the western shore of Maryland, in Delaware and in Virginia, these insects have appeared in great numbers, voraciously attacking the crops." H. P. reports it in Connecticut (*N. Y. Weekly Tribune*, July 22, 1874); E. B. M. in Cape May county, N. J., (*ibid*, August 26, 1874). In June it was at Wilmington, Del., (*Daily Commercial* of that place, June 1, 1874). E. T. reports it during the same month in Oneida county, N. Y., (*Country Gentleman*, June 25, 1874); C. F. at Olney, Md., (*ibid*, July 30, 1874). The monthly reports of the Department of Agriculture record it in Alleghany, Cattaraugus, Delaware, Erie, Madison, Tioga, Wayne and Wyoming counties, N. Y.; Burlington, Gloucester and Salem counties in N. J.; Kent county in Del.; Alleghany, Baltimore, Caroline, Cecil, Carroll, Dorchester, Frederick, Hartford, Montgomery, Prince George and Queen Anne counties, in Md.; and Culpepper, Fauquier, Greenville, Highland, Page and Prince William counties, in Va.

Finally, the following parties have reported its appearance to me by letter: Rev. John G. Morris, Baltimore, Md., from around that city; T. L. Harison, Secy. N. Y. State Agr. Soc., from around Syracuse, N. Y.; W. K. Shelmire, Toughkennamon, from Chester county, Pa.; S. Lockwood, Freehold, N. J., from that vicinity; S. S. Rathvon, Lancaster, Pa., spoke of its increase in Lancaster county; Thos. Meehan reported it swarming in June around Germantown, Pa.

above that altitude, yet the eggs, or the larvæ just hatched from them were dried up and dead, will suggest the reason, which is probably due to the very dry atmosphere in connection with the cool nights.

ALARM ABOUT IT ABROAD.

In earlier reports I have expressed the opinion that there would be real danger of the insect finding its way to Europe when once it reached the Atlantic seaboard; and now that it has done so, the authorities in several of the European countries are taking active measures to prevent such a possible calamity as the introduction of our potato beetle might prove. The potato, to some of the European peoples, is of more national importance than to us, and we cannot wonder at the alarm manifested across the water, or at the interest which the subject creates there, as evidenced in the number of pamphlets, both in French, German and English which have lately appeared on the subject in Europe, and the numerous articles written for the periodical press.

The governments of Belgium, France, Switzerland and Germany have already prohibited the importation of American potatoes, and Italy, the Netherlands and Great Britain, which have been solicited to do so, are seriously inquiring into the necessities of the case. The British Government is naturally slow to take such stringent steps, which would perhaps more deeply affect it than the other nations mentioned, since Great Britain does the larger trade in American potatoes. In reply to Mr. Herbert, M. P. for Kerry, who recently asked the Chief Secretary for Ireland whether Her Majesty's government had taken any steps to prevent the introduction of the insect, Sir M. M. Beach sought to abate fear, rather underrated the danger, and wisely concluded that any interference with the trade should first have the most careful consideration. Those who have watched the insect's gradual spread during the past seventeen or eighteen years, from its native Rocky Mountain home to the Atlantic, and have seen how the lakes, instead of hindering its march into Canada, really accelerated that march, by affording carriage on vessels, rafters and other floating objects, can have no doubt that the danger felt by our transatlantic friends is real.

Yet I must repeat the opinion expressed a year ago—and which has been very generally coincided in by all who have any familiarity with the insect's economy—that if it ever gets to Europe it will most likely be carried there in the perfect beetle state on some vessel plying between the two continents. While the beetle, especially in the non-growing season, will live for months without food, the larva would perish in a few days without fresh potato tops, and would, I believe, starve to death in the midst of a barrel of potatoes, even if it could get there without being crushed; for while it so voraciously devours the leaves it will not touch the tubers. The eggs, which are quite soft and easily crushed, could, of course, only be carried over on the haulm or on the living plant; and while there is a bare possibility of the insect's transmission in this way, there is little probability of it since the plants are not objects of commercial exchange, and the haulm, on account of its liability to rot, is not, so far as I can learn, used to any extent in packing. Besides, potatoes are mostly exported during that part of the year when there are neither eggs, larvæ nor potato vines in existence in the United States. There is only one other possible way of transmission, and that is in sufficiently large lumps of earth, either as larva, pupa or beetle. Now, if the American dealers be required to carefully avoid the use of the haulm or shaw and to ship none but clean potatoes, as free as possible from earth, the insect's transmission among the tubers will be rendered impossible; and when such precautions are so easily taken, there can be no advantage in the absolute prohibition of the traffic in American potatoes. As well prohibit traffic in a dozen other commodities, in many of which the insect is as likely to be taken over, as in potatoes, and in some of which it is even more likely to be transported. The course recently adopted by the German government in accordance with the suggestion made in my last report, is much more rational and will prove a much better safeguard: It is to furnish vessels plying between the two countries with cards giving illustrated descriptions of the insect in all stages, with the request that passengers and crew destroy any stray specimens that may be found. Let England and Ireland, together with the other European governments, co-operate with Germany in this plan, and have such a card posted in the warehouses of seaport towns, and the meeting rooms of agricultural societies; and a possible evil will be much more likely avoided. Some of the English journals are discussing the question as to whether, with the more moist and cool climate of that country, our 10-lined potato beetle would thrive there, even if imported. There cannot be much doubt that the insect will rather enjoy the more temperate clime; for while it thrives best during comparatively dry seasons, both excessive heat and drouth as well as excessive wet are prejudicial to it.

It is argued by others that on the continent of Europe our Doryphora would not thrive if introduced, and in a recent letter received from M. Oswald de Kerchove, of Gand, Belgium, author of an interesting pamphlet on the insect,* that gentleman says: "I do not think that the Doryphora, awakened by our early warm weather, could resist the effects of the late cold which we are apt to have in these European countries." The idea that the climate of North America is less extreme than that of Europe is rather novel to us of the cisatlantic; and from a sufficiently long residence in England, France and Germany, I am decidedly of the opinion that they delude themselves who suppose that Doryphora could not thrive in the greater part of Europe; and that to abandon all precautionary measures against its introduction on such grounds would be the height of folly. An insect which has spread from the high table lands of the Rocky Mountains across the Mississippi Valley to the Atlantic, and that flourishes alike in the States of Minnesota, Wisconsin and Connecticut, and in Maryland, Virginia and Texas—in fact, wherever the potato succeeds—will not likely be discomfited in the potato-growing districts of Europe. Some few, again, have ridiculed the very idea of the insect's passage to Europe in any State, arguing that it is an impossibility for any coleopterous insect to be thus transferred from one country to another. Considering that half the weeds of American agriculture, and a large proportion of her worst insect pests, including two beetles—viz: the Asparagus Beetle (*Crioceris asparagi*,) and the Elm Leaf-beetle (*Galeruca calmariensis*)—in the very same family as our Doryphora, have been imported among us from Europe, there would seem poor foundation for such argument. Moreover, a number of other insects—among them some beetles—of less importance, may be included in the number of importations; and the Rape Butterfly (*Pieris rapæ*,) whose progress westward has been simultaneous with the Doryphora's eastward, and whose importation dates back but a few years, bears witness to the fact that insects more delicate and with fewer chances of safe transport than Doryphora, may succeed in getting alive from one country to the other, and in gaining a foothold in the new home.

---

* *L'Ennemi de la Pomme de Terre*, etc., Bruxelles, 1875.

The ravages of the insect, bad as they are, very naturally get exaggerated at such a distance from its native home, and the following from the London *Gardener's Chronicle*, gives altogether a too gloomy picture: "When once a field of potatoes has been attacked, all hope of a harvest must be given up; in a few days it is changed into an arid waste—a mere mass of dried stalks." It should not be forgotten that the American farmer by means of intelligence and a little Paris Green is pretty much master of the Doryphora.

One of the most amusing things growing out of the European agitation about this insect that has come to my notice, occurred in our own city of St. Louis. Our worthy Mayor Brown was importuned by a Belgian official for information about the insect, when, instead of ascertaining the facts, which he might easily have done, either from myself or from any of his bucolic friends, he chose to display his agrestic proficiency by publishing a reply in the daily papers. The following extract from the reply will show that a man may be a good mayor and yet cut a sorry figure as agriculturist or entomologist; for every reader of these reports will notice that there is scarcely a statement that is not opposed to the facts:

> Treating your letter, therefore, seriously, I have to state that there never has been a potato bug seen flying about St. Louis or any other city in the United States or territories; that the potato bug never has caused any alarm in any city nor in the country—only in certain seasons that seemed to be favorable to the production of them. I am not aware of the potato bug attacking any other vegetable. I consider the fears of the people of Belgium entirely groundless, even if the ravages of the potato bug had been great in any locality the past season (which it has not,) and is a matter of no apprehension or comment at the present time in this country.

Mayor Brown, though he has the reputation of being extremely versatile, has evidently not worked in a potato patch of late years! Nor did his letter seem to inspire much confidence among the Belgians, who, soon after its publication, passed an act prohibiting the importation of American potatoes.

IS IT POISONOUS?

This question, which was very fully discussed, pro and con, between the years 1866 and 1870, and settled in the affirmative, has been revived again by Prof. T. J. Burrill, of the Illinois Industrial University, who published an item, which went the rounds of the agricultural press, to the effect that the insect is not poisonous; a statement he supported by the facts that he had rubbed the juice from the mashed insect into a flesh cut, and had had some accidentally squirted into his eye, without any injurious effects resulting. Now I would not go to the extent of a certain sarcastic Chicago professor who affirms that he could fix up a decoction from the dead beetles that would cause a vacancy in the chair of Vegetable Physiology and Horticulture in the Illinois Industrial University, if Prof. Burrill inhaled it, and suggests that there are certain animals that poison will not affect, and that Prof. B. may be one of them; nor to the extreme of a Philadelphia physician who asserts that the tincture from this beetle is the most virulent of insect poisons, and that nothing can be compared with it except the Argas of Miana, in Persia, and the Coya in the valley Neyba, in Popayan, South America, according to Ulloa's Travels, Vol. I, p. 343.* Yet there are so many authenticated cases of poisoning by the fumes from the scalded insects, that it is surprising that Prof. Burrill should have so stoutly assumed the negative of the question without further research and experiment. It is as if I, who am not affected by poison ivy or bee sting, should insist on the harmlessness of either, in the face of their well known poisonous qualities, and their danger to many persons. I know of physicians who persist in disbelieving that death was ever caused by calubrine poison because they have never known a fatal case of snake-bite in their own experience; but skepticism of that which is outside one's own experience usually dwells most where that experience is limited. Since my acquaintance with the Colorado Potato-beetle, three cases of its poisonous influence have been reported to me by persons in whose judgment and veracity I have the utmost confidence,* and without for a moment doubting the facts Prof. Burrill has recorded, which are valuable as far as they go, I would simply say that they do not go far enough, and he has not solved the whole truth of the matter. That the juices of the mashed insects on the human skin are, as a rule, harmless, is proven by the hosts of farmers who have crushed them by hand, and I can testify to the fact from my own experience; indeed, scarcely any one who has had experience believes the wild stories of the poisonous nature of these juices. Yet the rule is not without exceptions, and I do not doubt that, with blood in certain bad conditions, persons have been poisoned by getting said juices into wounds or cuts. But the cases of undoubted poisoning from this insect—cases that have in some instances been serious and even proved fatal—are not from the juices of the body, but from the *bruising* or crushing of large masses, especially by burning or scalding large quantities at a time. The poison seems to be of a very volatile nature, and to produce swelling, pain and nausea very much as other animal poisons do, and Dr. C. Ruden, of Joliet, Ill., who, as quoted by Dr. Hale (*loc. cit.*, p. 103), experimented on himself by taking the saturated tincture internally —increasing the dose daily from two to twenty drops—experienced great disturbance of the bowels, swelling of the extremities, bloated face, protruding eyes, fever, great thirst and desire for something acid.

---

* See an article in the Transactions of the Homœpathic Medical Society of the State of New York, Vol. VIII, pp. 142-169, 1869, by E. M. Hale, M. D., of Chicago. In this article, which is mostly a quotation from the *American Entomologist*, with four poorly-colored lithographic plates made mostly from my wood-cuts, without credit, Dr. Hale brings together several well authenticated cases of poisoning.

---

* Even since this was written, and just as this Report is going to press, the following letter, under date of March 15, 1875, came to hand: "On June 1st, 1874, I was called to see a little boy, son of Mr. E. H. Torgis, residing in a little village about two miles from this city. I found the child unwilling to speak, with jactitation, quick breathing, florid condition of the skin, spitting viscid, frothy phlegm; at times a quick, rather rapid pulse, and shortly after my arrival a peculiar spasm. The case was puzzling to me, but that it was a case of poisoning from some source suggested itself at once. I made diligent inquiry into the case, and eventually the father described to me the manner in which the boy would gather his apron full of potato bugs and sit down by a flat stone and by the means of another stone would mash them one at a time. Of course, in so doing he inhaled the volatile properties of the insects' juices. The case was antidoted by the proper antidotes for such a case with marked results. On my second visit made in the evening, I found the face the same in appearance, but the temperature of the skin markedly different; the jaws were slightly relaxed and there was high fever. I then paid some attention to these symptoms, and after making three more visits discharged the case. Another case came to my notice. It was that of a farmer's wife who was in the habit of daily gathering the bugs and scalding or burning them. She was seized with swelling in the hands, burning in the stomach and distension of the abdomen. I attributed it to the same cause, and relieved it accordingly. I also saw two other cases somewhat similar, and from these observations am most thoroughly convinced that the insect is poisonous. J. H. FISHBURNE, M. D.

LOCK HAVEN, PA.

From the present state of the case, therefore, while there can be little danger in the cautious killing of the insect in the field, I would not advise recklessness in handling it in large quantities; and we should especially guard against collecting and destroying it by scalding or burning in such quantities. There is no longer any occasion for thus collecting and destroying the insects; and since the custom of tackling the enemy with the Paris Green mixture came into vogue, we have heard much less of potato bug poisoning.

THE USE OF PARIS GREEN.

The question as to the safety and advisability of the use of this mineral in counteracting the ravages of the Colorado Potato-beetle and of other noxious insects, was revived during the year by the reading of a paper before the National Academy of Science, by Dr. J. L. LeConte, of Philadelphia, "On the use of mineral poisons for the protection of Agriculture." After some introductory remarks the paper closed with the following passages:

> But in the interests of those to come after us, and for whom, rather than for ourselves, we wish to preserve the results of our labors, I do solemnly protest against the loose manner in which, on the recommendation of persons who have observed only the effects of these poisons upon the insect pests to which their attention has been directed, a most dangerous substance has been placed in the hands of a large mass of uneducated men. You will learn from those who will supplement these remarks the fearful extent to which the manufacture of this poison has increased upon agricultural demand. I can say, on the authority of a friend residing in one of the great agricultural centers of the West, that the druggists of his town order it by the ton.
>
> The ravages of the Colorado Potato-beetle, which has been the chief agent in introducing Paris Green into agriculture, commenced in the West many years ago, and its extension, at a regular rate, was predicted by entomologists, whose opinion was worthy to be received.
>
> The prediction has been verified almost to a year.
>
> Now it was within the power of the Government, through a properly organized scientific bureau for the protection of agriculture, to have ordered a commission, who would, after thoroughly investigating the subject, recommend proper measures to be adopted. I am free to say that the use of metallic poisons would not be one of them. But human labor, properly compensated and intelligently employed to avert a national calamity, such as has come upon us from the incursion of the insect, might, perhaps, have been one of the agents suggested.
>
> In a discourse before the American Association for the advancement of science, at Portland, Maine, in August, 1873, I recommended, among other measures for the promotion of economic entomology in the United States, the reorganization of the Department of Agriculture on a scientific basis for the proper protection and advancement of agriculture.
>
> This recommendation was made the basis for several efforts on the part of the farmers of the Mississippi Valley. But, as is usual in cases where the emoluments of office and the expenditure of public funds are at stake, the attempt at reform failed. I now appeal—and trust to your influence to give the appeal as wide a circulation as

possible—to the whole of the intelligent community of the country to stop this indiscriminate use of metallic poisons on the soil until the whole subject has been investigated, not by observers of the habits of insects, but by a properly constituted scientific commission of chemists, physiologists and entomologists, who will recommend a general system of attack upon our insect enemies without danger to our future agricultural prosperity.

The food-producers have not been strong enough to effect the much needed reform' Let the food-consumers now unite with them in demanding it.

The paper, which was discussed by several eminent scientists, then and there present, who conjured up all the possible cases of poisoning from Paris Green they could think of, in its careless handling, use in coloring wall paper, etc., provoked the following resolution :

Resolved, That a committee be appointed to investigate and report upon the subject of the use of poisons applied to vegetables or otherwise for the destruction of deleterious insects and other animals, and also the incautious use of poisons in the ornamentation of articles of food and destructive purposes generally, such, for instance, as the coloring of paper.

No one can hold that eminent entomologist, Dr. J. L. LeConte, in higher esteem than does the writer; and so just and to the point do I deem the remarks about our Department of Agriculture that I make place for them in full. Yet the position assumed regarding the use of Paris Green places my friend in the attitude of an alarmist, and subsequent writers, prone to exaggerate, have played upon the tocsin sounded by him till pictures of suffering and death from the use of the mineral; of the earth poisoned with it and sown with danger, are conjured up *ad libitum*. Quoth the Utica (N. Y.) *Herald*: "The eye of science sees the horrible spectre of the demon bug stalking over the patch where its body was struck down by the deadly Paris Green, and laughing in fiendish glee over the terrible retribution that awaits its slayer. * * * The chemical possibilities which may result in the poisoning of the vegetation raised from the poisoned soil are fearful to contemplate !" While, therefore, Dr. LeConte's object—which was evidently to cause more thorough experiments and investigations to be made than had hitherto been made—was praiseworthy enough, I consider the attitude assumed neither commendable nor tenable; first, because it takes no account of an extensive past experience; second, because it is contrary to that experience, and what experiment had already been made.

The subject is one of vast importance, and as it was my lot to be, perhaps, as instrumental as any one in causing the now general use of Paris Green, both for the Colorado Potato-beetle and for the Cotton-worm, I take pleasure in presenting the facts in the case, so far as they are known; for these facts will serve to dissipate much misapprehension, and certainly support the opinion previously expressed on the subject in these reports :*

PAST EXPERIENCE.—In the early history of the use of this mineral as an insecticide, most persons, myself included, were loth, on theoretical grounds, to recommend its general use ; and I have ever insisted that the many other mechanical and preventive measures, which, if persistently employed, are sufficient to defeat the foe, should be resorted to in preference. But the more diluted form and improved methods now-a-days employed in using the poison, render it a much safer remedy than it was a few years back; and no one should fail to take into account that during the past six years millions of bushels of potatoes have been raised, the leaves of which have been most thoroughly sprinkled with the Paris Green mixture, without any injurious effect to the tuber, or to persons using potatoes raised in this manner. Indeed, scarcely any potatoes have been raised in the Middle States during these years, without its use; yet I have to learn of the first authentic case of poisoning or injury whatever, except through carelessness and exposure to its direct influence. So far as experience goes, therefore, there is nothing to fear from the judicious use of the mineral. Let us then consider, from the best authority, what are the effects of its use as at present recommended: First, on the plant itself; second, on the soil; third, on man, indirectly, either through the soil or through the plant.

---

* We hear many fears expressed that this poison may be washed into the soil, absorbed by the rootlets, and thus poison the tubers; but persons who entertain such fears forget that they themselves often apply to the ground, as nourishment for the vines, either animal, vegetable or mineral substances that are nauseous, or even poisonous to us. Animal and vegetable substances, of whatsoever nature, must be essentially changed in character and rendered harmless before they can be converted into healthy tubers, and a mineral poison could only do harm by being taken with the potatoes to the table. That any substance, sprinkled either on the vines or on the ground, would ever accompany to the table a vegetable which develops underground, and which is always well cooked before use, is rendered highly improbable. There can be no danger in the use of sound tubers. But the wise and well-informed cultivator will seldom need to have recourse to Paris Green, as he will find it more profitable to use the different preventive measures that have, from time to time, been recommended in these columns.

The poison may do harm, however, by being carelessly used, and it is most safely applied when attached to the end of a stick several feet long, and should not be used where children are likely to play.—[3d Rep., pp. 99-100.

Some persons have even imagined that potatoes grown on land where it has been used are often watery, rank and of bad flavor, and according to the Monthly Report from the Department of Agriculture for August and September last, peas planted in soil mixed with the green rotted immediately and would not germinate, while those in unadulterated soil grew finely and flourished, but died immediately when transplanted into the soil mixed with the Green. How far these statements are to be relied on, each one must judge for himself, but it is certainly advisable to avoid as much as possible the use of the poison, by carrying out the other methods, both preventive and remedial, advocated in previous Reports; for wholesale remedies always have the disadvantage of destroying some friends with the foes, and in this case the true parasites and those cannibals which by mastication partake bodily of their green-covered prey, certainly fall in the general slaughter. But this remedy has now been so extensively used with good results and without any apparent harm to the tubers, that full and thorough proof against it will be necessary to cause its abandonment. Properly mixed I have used it without the slightest trace of evil effect on the leaves or tubers, and I know hundreds of others who have done likewise; so that with present experience I should not hesitate to recommend its judicious use. What is wanted on this subject, is a long series of thoroughly accurate and reliable experiments. Let our Agricultural Colleges make them! Meanwhile Paris Green will be extensively used, especially while the vines are young and most need protection; for after the expense of preparing the land and planting has been incurred, it will not do to get discouraged and abandon the field to the enemy, when such an efficient remedy is at hand.—[4th Rep., pp. 11-12.

Its Influence on the Plant.—Practically the effect of sprinkling a plant with Paris Green, will depend very much on the amount used and on the character of the plant treated. Thus, from experiments which I made in 1872, a thorough coating of a mixture of one part of Green to fifteen of flour, while injuring some of the leaves of peas, clover and sassafras, had no injurious effect on young oaks, maples and hickories, or on cabbage and strawberries; while the fact has long been known that when used too strong and copiously it destroys potato vines. It is for this reason that the experiments made during the past year on beets, by a committee appointed by the Potomac Fruit Grower's Society, are of little value, as against the universal experience of the farmers of the Mississippi Valley. The mixture used by the committee, and which they call "highly diluted," consisted of one part of Green with but six of the dilutent, instead of from twenty-five to thirty parts of the latter; and it is no wonder that, as reported by the committee, the vitality of the plants was seriously impaired. There can be no question, therefore, about the injurious effect of the Green upon potato vines, when it is used pure or but slightly diluted; yet in this case, since it is the office of the leaves to expire rather than inspire, we cannot say that the plant is injured, or killed by absorption, any more than if it were injured or killed by hot water, which, according to the degree to which it is heated, or the copiousness of the application, may either be used with impunity or with fatal effects. Indeed, judging from my own experience, I very much incline to believe that future careful experiments will show that injury to the leaf by the application of this compound, arises more often from the stoppage of the stoma, which is effected as much by the dilutent as by the arsenite itself. So much for the influence of the poison when coming in contact with the plant above ground. The question as to how it affects the plant below ground, through the roots, may be considered in connection with—

Its Influence on the Soil.—As Prof. J. W. Johnson, in an admirable review of this subject, has recently stated:* "One pound of pure Paris Green contains about ten ounces of white arsenic, and about four ounces of copper;" or, to state it in the usual way, Sweinfurt or *pure* Paris Green contains fifty-eight per cent. of arsenious acid. One pound of the Green uniformly spread over an acre of soil, would amount to sixteen-hundredths of a grain per square foot, or nine-hundredths of a grain of arsenious acid. If uniformly mixed with the soil to the depth of a foot, it would, of course, be the same to the cubic foot. In actual practice, even this amount does not reach the soil direct or in an unchanged form, since much of it is acted upon by the digestive organs of the fated insects. It is safe to say that even if the Green retained for all time its poisonous power and purity in the soil, this mere fractional part of a grain might be added annually for half a century without any serious effects to the plants. In reality, however, there is no reason to believe that it does so remain. Of the few experiments on record which bear on this point, those made by Prof. W. K. Kedzie, while connected with the Michigan Agricultural College, in 1872, are the most interesting and instructive. In a paper read before the Natural History Society of the College, he proved, from these experiments, that where water was charged with carbonic acid or ammonia, a certain portion of the Green was dissolved, but was quickly converted into an insoluble and harmless precipitate with the oxide of iron which exists very generally in soils. Fleck has shown (Zeitschrift für Biologie, Bd. viii, s. 455, 1872) that arsenious acid in contact with moist organic substances, especially starch sizing, forms arseniuretted hydrogen, which diffuses in the air; and it is more than probable that the Green used in our fields will lose its poisonous power, and disappear in these and other ways. The question as to how the plant is affected by the poison through the soil is, therefore, partly answered by the above facts. Water is both the universal solvent and the vehicle by which all plants appropriate their nourishment; but in this instance its solvent and carrying power is for the most part neutralized by the oxide of iron in the soil; and though some experiments by Dr. E. W. Davy, and quoted by Prof. Johnson in the article already cited, would indicate that, under certain circumstances, some of the arsenious acid may be taken up by plants before passing into the insoluble combination; yet the quantity is evidently very slight.

---

* New York Weekly Tribune, December 16, 1874.

Some persons have imagined that the soggy and watery potatoes that have been so common of late years are due to the influence of this poison; but this idea is proved to be erroneous by the fact that such imperfect potatoes are not confined to the districts where Paris Green has been used. Indeed, they are much more likely due to the injury and defoliation of the plant by the insect; for no plant can mature a healthy root when its leaf system is so seriously impaired by the constant gnawings of insects. Finally, we must not forget that both arsenic and copper are widely distributed throughout the inorganic world[*] and are found naturally in many plants; and so far from injuring plants, in minute quantities, arsenic occurs in the best superphosphates and the volcanic soil around Naples, which, like all volcanic soils, contains an unusual amount of it, has the reputation of being a specific against fungoid diseases in plants. A certain quantity may therefore be beneficial to plants, as it appears to be to animals, since horses fed on a grain or two a day are said to thrive and grow fat.[†]

ITS INFLUENCE ON MAN INDIRECTLY THROUGH THE SOIL OR THROUGH THE PLANT.—The Green as now used could not well collect in sufficient quantities to be directly deleterious to man in the field in any imaginable way; while its injury through the plant is, I think, out of the question; for the plant could not absorb enough without being killed. The idea that the earth is being sown with death by those who fight the Colorado Potato-beetle with this mineral, may, therefore, be dismissed as a pure phantasmagoria.

In conclusion, while no one denies the danger attending the careless use of Paris Green, and all who have recommended its use have not hesitated to caution against such carelessness, a careful inquiry into the facts from the experimental side bears out the results of a long and extensive experience among the farmers of the country—viz: that there is no present or future danger from its judicious use, in the diluted form, whether as liquid or powder, in which it is now universally recommended. Nor is the wholesale charge made by Dr. LeConte that the remedy has been recommended by persons who have observed only the effects of the poison on the insects to which their attention has been directed, warranted by the facts. It is in this as in so many other things, a proper use of the poison has proved, and will prove in future, a great blessing to the country, where its abuse can only be followed by evil consequences. Poison is only a relative term and that which is most virulent in large quantities is oftentimes harmless or even beneficial to animal economy in smaller amounts. The farmers will look forward with intense interest to the work of the committee appointed by the National Academy, or of any national commission appointed to investigate the subject, and will hail with joy and gratitude any less dangerous remedy that will prove as effectual; but until such is discovered, they will continue to use that which has saved them so much labor and given so much satisfaction. I would therefore say to those agriculturists of the East who are in any way alarmed by what has been written on this subject, and who hesitate to use the Paris Green mixture—profit by the experience of your more western brethren, and do not allow the voracious Doryphora to destroy your potatoes, when so simple and cheap a remedy is at hand!

---

[*] Prof. Johnson, (*loc. cit.*) writes:

> The wide distribution of both arsenic and copper is well known to mineralogists and chemists. These metals are dissolved in the waters of many famous mineral springs, as those of Vichy and Wiesbaden. Prof. Hardin found in the Rockbridge Alum Springs of Virginia, arsenic, antimony, lead, copper, zinc, cobalt, nickel, manganese, and iron. The arsenic, however, was present in exceedingly minute quantity. Even river water, as that of the Nile, contains an appreciable quantity of arsenic. Dr. Will, the successor of Liebig at Giessen, proved the existence of five poisonous metals in the water of the celebrated mineral springs of Rippoldsau, in Baden. In the Joseph's Spring he found to 10,000,000 parts of water arsenic (white,) 6 parts; tin oxide, 1-4 part; antimony oxide, 1-6 part; lead oxide. 1-4 part; copper oxide, 1 part. Arsenic and copper have been found in a multitude of iron ores, in the sediments from chalybeate springs, in clays, marls and cultivated soils. But we do not hear that the arsenic thus widely distributed in waters and soils ever accumulates in plant or animal to a deleterious extent.

[†] See an article on "Arsenic in Agricultural and Technical Products," by Prof. A. Vogel, in *Scientific American*, Oct. 17, 1874.

THE BEETLE EATS AS WELL AS THE LARVA.

As the statement has been quite frequently made during the year, in Eastern papers, that the beetle does not feed, and that consequently there is nothing to fear from them early in the year, the fact may as well be reiterated that the beetle does feed, though not quite so ravenously as the larva. But as they are on hand as soon as the young plants peep through the ground, and as these first spring beetles are the source of all the trouble that follows later in the season, it is very important to seek and destroy them.

IT PASSES THE WINTER IN THE BEETLE STATE.

The statement is continually made that the insect hibernates as a larva. "I must insist that with us it never does, but that the last brood invariably hibernates in the perfect beetle state. Specimens have been found at a depth of eight and even ten feet below the surface, but the great majority do not descend beyond eighteen or twenty inches, and many will not enter the ground at all if they can find other substances above ground that will shelter them sufficiently. The beetles are found abundantly above the ground in the month of April in the latitude of St. Louis, but often re-enter it after they have once left, especially during cold, damp weather."—[4th Report.

NEW FOOD PLANTS.

Mr. A. W. Hoffmeister, of Ft. Madison, Iowa, an entomologist, the accuracy of whose observations may be relied on, writes:

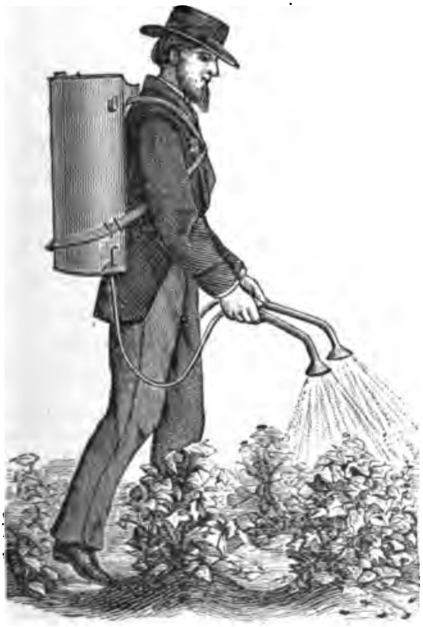
> Last year, after all the early potatoes had been taken up and the late ones either wilted through excessive dryness or eaten up by the Colorado gentleman, I was astonished to find so many 10-lined spearmen in the lower part of town, while in the upper part they were reasonably scarce; but I was more astonished to find that the larvæ had stripped the *Verbascum* of its leaves.

The Mullein, belonging to the Figwort family, must therefore be added to the list of plants on which the insect lives and flourishes. An item went the rounds of the papers during the year to the effect that alfalfa is greedily devoured by this insect, but just how much credit should be given to the statement, which originated with a Montana correspondent of the *Farmer's Home Journal* of Kentucky, it is difficult to say. Probably the reference was originally made to the old-fashioned "potato-bugs," or blister-beetles, which are common in the Western country and very general feeders.

NEW MEANS OF DESTRUCTION.

The use of Paris Green having become a universal remedy for this pest, there is little to be said under this head, except as regards the improved methods of using the application. Last spring, Mr. Frank M. Gray of Jefferson, Cook county, Ills., sent me a sprinkler which he has constructed for sprinkling two rows at once. It is so simple and yet so useful that a brief description of it will not be out of place here. It consists of a can capable of holding about eight gallons of liquid, and so formed as to rest easily on the back, to which it is fastened, knapsack fashion, by adjustable straps, which reach over the shoulders and fasten across the breast. To the lower part of the can are attached two rubber tubes which are connected with two nozzles on sprinklers. The inside of the can has three shelves which help to keep the mixture stirred. There is a convenient lever at the bottom which presses the tubes and shuts off the outflow at will, and two hooks on the sides near the top on which to hang the tubes when not in use. On the top is a small air-tube and a capped orifice. Two bucketfulls of water are first poured into the can, then three tablespoonfulls of good Green, well mixed with another half-bucketfull of water and strained through a funnel-shaped strainer which accompanies the machine, and the use of which prevents the larger particles of the Green from getting into the can and clogging up the sprinklers. Five to eight acres a day can readily be sprinkled by one man using the can, and from one to one and a half pounds of good Green, according to the size of the plants

[Fig. 1.]



Gray's Improved Sprinkler, for the use of Paris Green water.

will suffice to the acre. Two lengths of nozzles are furnished, one for use when the plants are small, the other when they are larger. The can should be filled on the ground and then raised on a bench or barrel, from which it is easily attached to the back. The walking serves to keep the Green well shaken, and the flow of liquid is regulated at will by a pressure of the fingers at the junction of the tubes with the metallic nozzles. When not in use, the tubes should be removed and the can emptied and laid on its back. I can testify to the ease and efficiency with which this little machine may be used, and it has been so well thought of that it is now manufactured and for sale at 66 W. Madison street, Chicago, though I do not know at what price.

THE PROPER SCIENTIFIC NAME OF THE BEETLE.

Of course the American reader need not be informed of the fact that this insect has been universally known, since it attained popular notoriety, by the scientific name of *Doryphora* 10-*lineata* Say. American coleopterists have from the first been fully aware that it differed from the typical genus *Doryphora* in lacking the point produced on the mesosternum (middle of breast), which is characteristic of that genus as defined by its founder, Olivier. Yet as this character is of secondary importance, and by no means of generic value, in many other families of Coleoptera; and our insect in other characters, and especially in the short and transverse form of the maxillary palpi, approaches nearer to the genus *Doryphora* than to any other genus of its sub-family (*Chrysomelides*), that father of American Entomology, Thomas Say, described it under that genus. Subsequent American authorities, including Dr. LeConte, have followed this enlarged definition of the genus *Doryphora*, considering the palpial of much more value than the sternal characters; and Say's name has consequently been universally adopted in this country both by popular and technical writers. The genus *Chrysomela* of Linnæus has been made the basis of several minor divisions, which are considered to be of generic value or not, according to the opinions of different systematists. Thus Melsheimer in his catalogue of N. A. Coleoptera (1853) refers our potato-beetle to the genus *Polygramma* erected by the French entomologist Chevrolat upon unimportant colorational characters. Recently, the Sweedish entomologist Stäl in a Monograph of the American Chrysomelides* erects the genus *Myocoryna*, on the slightly compressed form of the antennal club, for our potato beetle, and several other species from Texas and Mexico. Until some yet distant day when the science of entomology shall be perfected, there will be a constant chopping and changing in generic nomenclature (much of it of questionable warrant or advantage), and it is ofttimes preferable, especially in popular works, to anchor to the more comprehensive and better known generic terms, instead of confounding the reader by the more recent changes. There is nothing to prevent any author from erecting new genera, but whether a proposed genus is in the end by common consent adopted or not will depend on the value of the characters on which it is founded. Our best authorities ignore the more recent divisions, and LeConte writes me: "Let us set our faces against the adoption of the multitude of genera, which even the founders fail to sustain. * * * Let *Polygramma*, *Leptinotarsa*, *Myocoryna*,* etc., never be mentioned amongst us." Thence, if we write *Chrysomela* 10-*lineata* (Say), with Crotch, in his list of N. A. Coleoptera (1873), we indicate that in our opinion the later divisions into which that genus has been broken up, and which would include this species, are not based on sufficiently important and distinctive characters; if we write *Doryphora* 10-*lineata* Say, we express our belief in the generic value of the palpial characters. In either event no confusion will ensue providing the authority for the species is given, and the American entomologist does no violence either to good sense or propriety by designating the insect as it was at first described, i. e., *Doryphora* 10-*lineata*. It is because of the present unsettled conditon of entomological nomenclature that the custom yet prevails of attaching the abbreviated authority to the names of insects, as the only sure way to express our meaning and obviate all confusion as to the species intended.

---

* Trans. Sweedish Academy, 1858, p. 316.

I have been led to these synonymical remarks by an article by M. E. A. Carrière, which, had it occurred in a less important journal than the *Revue Horticole*,† of which he is editor, would not deserve notice. With an arrogance in keeping with the superficial knowledge of the subject he displays, M. Carrière undertakes to read the Americans an entomological lesson, teach them how to correctly designate this potato enemy and "cut short the confusion" which he takes it for granted exists on the subject in this country. As the idea is altogether too prevalent among European writers that American naturalists are a set of know-nothings, I shall briefly notice this article of M. Carrière's to show how ridiculously pragmatical he appears in the eyes of those whom he attempts to teach, however much his show of erudition may awe his French readers.

---

* Even if the characters given by Stål are ever considered by authors generally of generic value, the name *Myocoryna* could not be employed, as it is preoccupied by a genus, in the same family of Chrysomelians, founded by Dejean (Cat. 3d edit., p. 428); and if our potato-beetle is to be known by any subgeneric title I would propose that of *Thlibocoryna*.

† Subsequently noticed in several European periodicals, and republished in the *Journal d' Agriculture Pratique*, and in the Bulletin of the *Soc. Centrale d' Agr. du Dep. de l' Hérault*, 1874, pp. 84-5.

First, then, we are informed that our insect should be referred to the genus *Chrysomela*, or else—admitting the subdivisions of that genus—to the sub-genus *Polygramma* of Chevrolat. Considering that before M. Carrière wrote, Crotch had made the former reference, and Melsheimer many years previously, the second—this information is not novel.

Secondly, we are gravely told that another error "more difficult to comprehend, because it is pure nonsense," consists in calling the insect by the specific name of *decempunctata!* Since no American entomologist has ever called it by that name, and it was first so designated in a foreign journal, by mistake, M. Carrière might have saved himself the exhaustive effort to comprehend it.

Thirdly, M. Carrière considers the *juncta* of Germar as a synonym of 10-*lineata* Say, a thing which no entomologist at all informed would think of doing to-day, after the characters of the two have been so well defined in this country.

Fourthly, he undertakes to define this amalgamated species, and does it in so bungling a way that only general characters are given, and the most distinctive features omitted. Yet with complacency he speaks of this definition as "these details which we have deemed necessary to particularize and firmly establish the identity and the character of *C. decemlineata!!*"

Fifthly, we are gravely informed that our beetle is not a fly (*mouche*)—most interesting information, since no one in America calls it a "fly."

Sixthly, we are told that *Colorado* is the vulgar name for the insect—a statement which shows that its author is as good a geographer as he is entomologist. He then declares that no remedy has been discovered "for that which is employed is no less redoubtable than the evil itself;" ridicules (as do all who have no proper knowledge of the important part played by parasitic and predaceous insects in keeping the vegetable feeders in check) the idea of benefit to man from predaceous insects; and closes by recommending certain remedies, which have been proved useless here and are the conceptions of inexperience.

Such are some of the more glaring errors in this production of a gentleman who plays the role of instructor to the American entomologists. In short, instead of deriving his information from trustworthy sources, and ascertaining what had really been written by Americans on this subject, as every cautious critic would have done, M. Carrière gets all he possessed at second hand from the poor translations, in certain London journals, of Col. F. Hecker's communication to the *Gartenlaube*, which I referred to in my Sixth Report (p. 15). He thus lances his criticisms at imaginary errors, and in attempting to be deep becomes extremely shallow.

THE CHINCH BUG—*Micropus leucopterus* (Say).

(Subord. HETEROPTERA; Fam. LYGÆIDÆ.)

Never, perhaps, in the history of the country, and certainly never in the history of the State of Missouri, was the Chinch Bug so disastrous in its work as during the year 1874. This fact is explained in part by the very dry weather which prevailed during early summer in the Northwestern States—weather favorable to the insect's well-being and multiplication—but was also greatly due to the very dry Fall of 1873 and the following comparatively mild and dry Winter; conditions that permitted the survival of an unusually large number of the bugs, which dispersed over our fields in the spring and gave birth to myriad young, which throve and prospered amazingly. In order to gather as complete statistics as possible about this insect in Missouri, I sent the following questions to several prominent farmers in every county in the State:

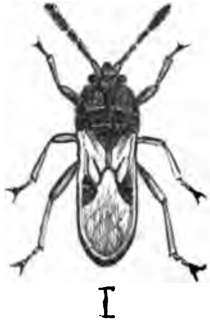
1. How far back in the history of your county has this insect (the Chinch Bug) been known to injure the grain and grass crops?
2. What crops have suffered most from its ravages?
3. Have any systematic efforts ever been made to overcome its injuries; and have you any idea to what extent my Second Report—which contained what was known about the insect up to that time, and which was bound in with the Fifth (1869) State Agricultural Report—is distributed or known of among the farmers of your county?
4. Give approximately this year's estimated damage in your county, by this single insect—all crops affected by it considered.

Replies to these questions have been received from nearly every county, and I am under obligations to the many gentlemen throughout the State who have thus assisted me. To publish these replies in full would occupy altogether too much space, and would be unnecessary; yet, as there is much valuable experience contained in them, I have brought together such parts as will most generally interest the farmers of the State, in an Appendix at the end of this article.

It will be seen that the replies to the third question are almost unanimous to the effect that little or nothing is known or has been seen of the Second Entomological Report; and it is for this reason and from the number of letters of inquiry about the insect that reached me about harvest time last Summer, that I deem it advisable to give a full account of the Chinch Bug in the present volume, reproducing, in quotation marks, portions of the article referred to in the Second Report.

APPEARANCE AND TRANSFORMATIONS OF THE CHINCH BUG.

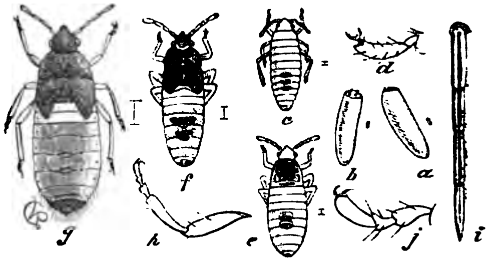
[Fig. 2.]



CHINCH BUG: Hair line underneath showing natural size.

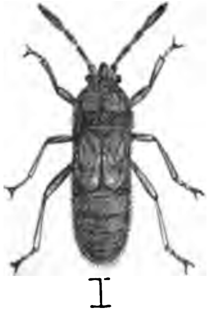
Few farmers in this section of the country need an introduction to this insect; but lest there be those who are so blessed as not to know the gentleman by sight, I annex his portrait. Known to science as *Micropus leucopterus*, he belongs to the Half-wing Bugs (*Heteroptera*,) the same sub-order to which a well known bed pest belongs, and he exhales the same most disagreeable odor. He subsists by sucking with his sharp pointed beak (Fig. 3, *i*) the grasses and cereals, thereby causing them to shrink, wilt and wither—and not by biting their substance as many persons suppose. Like the other species of its sub-order, it undergoes no very sudden transformations. Born as a little pale yellow 6-legged atom, scarcely visible to the naked eye, and with a tinge of red near the middle of the body, (Fig. 3, *c*,) it goes through four molts before acquiring wings. It is bright red, with a pale band across the middle of the body after the first; somewhat darker with the merest rudiments of wing-pads after the second, and quite brown, with distinct wing-pads, but with the pale transverse band still visible, after the third, in which it assumes the pupa state, and from which, in the fourth molt, it escapes as a winged bug.

[Fig. 3.]



IMMATURE STAGES OF CHINCH BUG:—*a*, *b*, eggs; *c*, newly-hatched larva; *d*, its tarsus; *e*, larva after first molt; *f*, same after second molt; *g*, pupa—the natural sizes indicated at sides; *h*, enlarged leg of perfect bug; *j*, tarsus of same still more enlarged; *i*, proboscis or beak, enlarged.

[Fig. 4.]



SHORT-WINGED CHINCH BUG.

"There are, as is well known to entomologists, many genera of the Half-winged Bugs, which in Europe occur in two distinct or "dimorphous" forms, with no intermediate grades between the two; namely, a short-winged or sometimes even a completely wingless type and a long-winged type. Frequently the two occur promiscuously together, and are found promiscuously copulating so that they cannot posibly be distinct species. Sometimes the long-winged type occurs in particular seasons, and especially in very hot seasons. More rarely the short-winged type occurs in a different locality from the long-winged type, and usually in that case in a more northerly locality. We have a good illustration of this latter peculiarity in the case of the Chinch Bug, for a dimorphous short-winged form occurs in Canada, and Dr. Fitch describes it from specimens received from the States, as a variety, under the name of *apterus*."

DESCRIPTIVE.

MICROPUS LEUCOPTERUS (Say.)—*Egg*—Average length 0.03 inch, elongate-oval, the diameter scarcely 1-5 the length. The top squarely docked and surmounted with four small rounded tubercles near the center. Color, when newly laid, pale or whitish, and translucent, acquiring with age an amber color, and finally showing the red parts of the embryo, and especially the eyes toward tubercled end. The size increases somewhat after deposition, and will sometimes reach near 0.04 inch in length.*

Larval Stages.—The newly hatched larva is pale yellow, with simply an orange stain on the middle of the three larger abdominal joints. The form scarcely differs from that of the mature bug, being but slightly more elongate; but the tarsi have but two joints (Fig. 4, *d*,) and the head is relatively broader and more rounded, while the joints of body are sub-equal, the prothoracic joint being but slightly longer than any of the rest. The red color soon pervades the whole body, except the first two abdominal joints, which remain yellowish, and the members, which remain pale. *After the first molt* the red is quite bright vermillion, contrasting strongly with the pale band across the middle of the body, the prothoracic joint is relatively longer, and the metathoracic shorter. The head and prothorax are dusky and coriaceous, and two broad marks on mesothorax, two smaller ones on metathorax, two on the fourth and fifth abdominal sutures, and one at tip of abdomen are generally visible, but sometimes obsolete; the third and fourth joints of antennæ are dusky, but the legs still pale. *After the second molt* the head and thorax are quite dusky, and the abdomen duller red, but the pale transverse band is still distinct; the wing-pads become apparent, the members are more dusky, there is a dark red shade on the fourth and fifth abdominal joint, and, ventrally, a distinct circular dusky spot covering the last three joints.

Pupa—In the pupa all the coriaceous parts are brown-black, the wing-pads extend almost across the two pale abdominal joints which are now more dingy, while the general color of the abdomen is dingy gray; the body above is slightly pubescent, the members are colored as in the mature bug, the three-jointed tarsus is foreshadowed, and the dark horny spots at tip of abdomen, both above and below, are larger.

Imago—The perfect insect has been well described, and I will append the original descriptions:

> LYGÆUS LENCOPTERUS (chinch bug). Blackish, hemelytra white with a black spot. Inhabits Virginia.
>
> Body long, blackish, with numerous hairs. Antennæ, rather short hairs; second joint yellowish, longer than the third; ultimate joint rather longer than the second, thickest; thorax tinged with cinereous before, with the basal edge piceous; hemelytra white, with a blackish oval spot on the lateral middle; rostrum and feet honey yellow; thighs a little dilated.
>
> Length less than three-twentieths of an inch.
>
> I took a single specimen on the eastern shore of Virginia.
>
> The whiteness of the hemelytra, in which is a blackish spot strongly contrasted, distinguishes this species readily—[Say, Am. Entomology, I, p. 329.

---

*This last is the length given by Dr. Shimer. The stricture on this measurement in my 2d Report (p. 22.) first appeared in the *American Entomologist*, in an editorial prepared principally by Mr. Walsh, and was made without having measured the egg.

The above description originally appeared in 1832, in a pamphlet entitled "Descriptions of new species of Heterocerous Hemiptera of N. A."

Length 1¾ lines, or three-twentieths of an inch. Body black, clothed with a very fine grayish down, not distinctly visible to the naked eye; basal joint of the antennæ honey yellow; second joint of the same tipt with black; third and fourth joints black; beak brown; wings and wing-cases white; the latter are black at their insertion, and have near the middle two short irregular black lines, and a conspicuous black marginal spot; legs dark honey yellow, terminal joint of the feet, and the claws black.—[Dr. Wm. LeBaron in the *Prairie Farmer* for September, 1850, vol. x, pp. 280, 281, where the name of *Rhyparochromus devastator* is proposed for it.

Dr. Fitch also enumerates the following varieties of this insect:

a, *immarginatus*. Basal margin of the thorax not edged with yellowish. Common.

b, *dimidiatus*. Basal half of the thorax deep velvety black, anterior half grayish. Common.

c, *fulvivenosus*. The stripes on the wing covers tawny yellow instead of black.

d, *albivenosus*. Wing covers white, without any black marks except the marginal spot. A male.

e, *apterus*. Wingless and the wing covers much shorter than the abdomen.

f, *basalis*. Basal joint of the antennæ dusky and darker than the second.

g, *nigricornis*. Two first joints of the antennæ blackish.

h, *femoratus*. Legs pale livid yellow, the thighs tawny red. Common.

i, *rufipedis*. Legs dark tawny red or reddish brown.

To these varieties, all of which occur with us, I would add one which may be known as *melanosus*, in which the normal white of the wings is quite dusky, and contains additional black marks at base and toward tip, and in which all the members and the body except the rufous hind edge of thorax are jet black.

PAST HISTORY OF THE CHINCH BUG.

"The first record we have of the prevalence of the Chinch Bug was in the old Revolutionary times in North Carolina, where it was confounded with the Hessian Fly, an insect just then imported from Europe into the United States. Ever since those times it has been an epidemic pest, in particular years, in North and South Carolina and in Virginia. The great American entomologist, Thomas Say, in 1831, when he had been residing in Indiana for six years, was the first to name and describe it scientifically. He states that he 'took a single specimen on the Eastern shore of Virginia;' whence we may reasonably infer that it was then either unknown or very rare in Indiana, and probably also in other Western States."

PAST HISTORY OF THE CHINCH BUG IN MISSOURI.

In the Appendix will be found records of this insect as far back as 1836 in two counties in Missouri. W. D. Palson, of Southwest City, McDonald county, writes: "I have been here ever since 1836, and have seen the bugs ever since I could recollect, but never knew what they were until 1873." D. P. Dyer, of Warrenton, Warren county, also speaks of their appearance during the same year. No very serious damage was however done at this time by the insect, and not until 1844 are any complaints made. From this time it gradually increased in numbers, and during the summers of 1854, 55, 56, 57 and 59 did much damage to all kinds of cereals and grasses. In 1866 they were quite bad and also in 1870 and 1871, while during the dry years of 1872 and 1873, they spread pretty much all over the State and were injurious in counties like Scott, Greene and Mississippi, where they had scarcely been noticed before.

"We may safely conclude that the Chinch Bug has always existed in Missouri, in small numbers; but that it did not multiply to an injurious extent until the grains began to be cultivated on an extensive scale. At all events, we know from the evidence of Dr. Harris and Dr. Fitch, that it existed long ago in exceedingly small numbers in New York, and even in Massachusetts. What the causes may have been that thinned out the numbers of this insect in former times in the West, is another question. In former times, the great bulk of these bugs were probably destroyed every winter by the prairie fires, and, as cultivation has extended in consequence of the country being gradually settled up, and less and less prairie has been annually burnt over, the number that has survived through the winter to start the next year's broods has annually become greater. If these views be correct, we may expect them, unless more pains be taken to counterwork and destroy them, to become, on the average of years, still more abundant than they now are, whenever prairie fires shall have become an obsolete institution; until at last Western farmers will be compelled, as those of North Carolina have already several times been compelled, to quit growing wheat altogether for a term of years.

"It may be very reasonably asked, why the Chinch Bug does not increase and multiply in Massachusetts and New York, seeing that it existed there long ago, and that there are, of course, no prairie fires in those States to keep it in check. The answer is, that the Chinch Bug is a Southern, not a Northern species; and that hundreds of Southern species of insects, which on the Atlantic seaboard only occur in southerly latitudes, are found in profusion in quite a high latitude in the Valley of the Mississippi. The same law, as has been observed by Professor Baird, holds good both with Birds and with Fishes."*

The Chinch Bug will, also, for reasons which will presently be made apparent, naturally thrive less in the moister climate of the New England States. Again we may very naturally infer that the more cleanly and careful system of culture, and the more general use of the roller in the older States have had much to do with the comparative immunity they enjoy. I am also of the opinion that it will not multiply as much on a sandy as on a clayey loam, for the reason that it cannot move about as readily in such a soil; and the immunity of grain immediately along the Missouri river in Cole county, attested by Mr. N. DeWyl and others, is, I think, more due to the sandy nature of the soil, compared to that farther back of the river, than to the greater moisture in the immediate vicinity of the river.

---

*Silliman's Journal, XLI, p. 87.

DESTRUCTIVE POWERS OF THE CHINCH BUG.

Though but one of the many insect pests that afflict the farmer, it is, perhaps, all things considered, the most grievous. Few persons who have not paid especial attention to the subject have any just conception of the amount of damage the Chinch Bug sometimes inflicts, and many will be surprised to learn that, setting aside the injury done to corn, the loss which the little scamp occasioned to the small grains in the Northwestern States in 1871, amounted to upwards of thirty million dollars, at the very lowest estimates—as proved by careful computations made by Dr. LeBaron in his Second Annual Report as State Entomologist of Illinois. The loss in 1874 may safely be put down at double that sum. Indeed, not even the migratory locusts that, from time to time, spread devastation over the western country can be compared in destructiveness to this little bug; for his devastations, though not so general, are more incessant, and cover a more thickly settled range of country. Those who have not seen the ground alive and red with its young, or the plants black with the dark bodies of the more mature individuals; those who have not seen the stout cornstalk bow and wilt in a few hours from the suction of their congregated beaks, or a wheat field in two or three days rendered unfit for the reaper; those who have never seen the insect marching in solid phalanx from field to field, or absolutely filling the air for miles —can form no adequate conception of its destructive powers! It is no wonder, therefore, that Kirby and Spence, more than half a century ago, exclaimed, in speaking of this "chintz-bug-fly," that "it seems very difficult to conceive how an insect that lives by suction, and has no mandibles, could destroy these plants so totally." *

ITS INJURIES IN 1874.

Though we have had previous bad Chinch Bug years, of which the more recent ones of 1864, 1868 and 1871 may be mentioned, yet I doubt whether in any one previous year it has occasioned such widespread destruction. Its greatest injury is usually confined to the spring wheat belt, which includes, roughly speaking, South and Central Illinois, North and Central Missouri, South Nebraska and Kansas;

---

* Introduction to Entomology, London, 1828, Vol. I, p. 171.

but its ravages the past year were reported over a far wider range of country, and extended south to Texas and Arkansas and east to Virginia. Even in Kentucky, where it does not usually attract much attention, Mr. John C. Noble, of Paducah, wrote me last June that the corn in the western counties was being ruined by it. Any estimates of the loss to the country at large must necessarily be crude, and the figures would foot up till they would appear incredible. I shall therefore confine myself more particularly to

ITS INJURIES IN MISSOURI IN 1874.

From the detailed county returns in the Appendix the estimated loss by counties may be stated as follows:

Adair, $20,000; Andrew, $140,000; Atchison, $217,000; Barry, $80,000; Barton, $100,000; Bates, $500.000; Benton, $350,000; Buchanan, $100.000; Butler, $120,000; Caldwell, $125,000; Cape Girardeau, $40,000; Carroll, $550,000; Cass, $500,000; Cedar, $278,000; Chariton, $600,000; Christian, $45,000; Clark, $50,000; Clay, $350,000; Clinton, $300,000; Cole, $130,000; Cooper, $150,000; Crawford, $90,000; Dallas, $50,000; Daviess, $400,000; DeKalb, $230,000; Douglas, $25,000; Dunklin, no bugs; Franklin, $160,000; Gasconade. $65,000; Gentry, $220,000; Greene, $300,000; Grundy, $125,000; Harrison, $255.000; Henry, $600,000; Hickory, $130,000; Holt. $540,000; Howard, $50,000; Iron, $180,000; Jackson, $450,000; Jasper, $230,000; Johnson, $700.000; Knox, $30,000; Laclede, $45,000; Lafayette, $550,000; Lawrence, $210,000; Lewis, $58,000; Linn, $160.000; Macon, $155,000; Madison. $27,000; Maries, $100,000; Marion, $90,000; Mercer, $250,000; Mississippi, $15,000; Monroe, $280,000; Montgomery, $100,000; New Madrid, $50,000; Newton, $85,000; Nodaway, $100,000; Oregon, $10,000; Osage, $210,000; Ozark, $40,000; Perry, $50,000; Pettis, $300,000; Platte, $100,000; Polk, $300,000; Pulaski, $75,000; Putnam, $100,000; Ralls, $80,000; Randolph, $20,000; Ray, $250,000; Ripley, $40,000; St. Charles, $25,000; St. Clair, $375,000; St. Francois, $100,000; St. Genevieve, $125,000; Saline, $450,000; Scotland, $100,000; Scott, $50,000; Shelby, $50,000; Sullivan, $65,000; Taney, $45,000; Texas, $70,000; Vernon, $225,000; Warren, $120,000; Washington, $100,000; Wright, $60,000.

The aggregate loss from these counties foots up, therefore, to $15,385,000. From the remaining 28 counties, either no reports have been received, or they have been too meagre to form a basis on which to estimate. Some of these counties are not thickly settled, but, estimating by the census returns for 1870, and by the counties which have reported, and which made similar returns, the loss to these 28 counties would amount to about $3,615,000—making the total loss for the State, *nineteen million dollars!*

These calculations do not include any other than the three staple crops of wheat, corn and oats, and are based on the U. S. Census Report of 1870, and on average prices of 90c per bushel for wheat, 50c for corn and 60c for oats.

In taking no account of the increased acreage since 1870, nor of other cereals than those mentioned; and in estimating at prices below present market rates, the damage by drouth, independent of Chinch Bug, is fully offset, and the calculation must be below rather than above the mark. I am aware of the difficulty always encountered in endeavoring to get accurate crop reports and estimates; and, indeed, anything like accurate agricultural statistics is almost impossible in this country; yet the above figures cannot be far out of the way, and will certainly astonish our legislators, and even the farmers of the State, few of whom have any just conception of the vast sum this apparently insignificant little bug filches from their pockets. That the sum here given is below the actual loss will be appreciated all the more when I state that the estimated money loss through the Chinch Bug in Illinois, in 1864, was over seventy-three million dollars. The damage does not even stop here, but brings many serious indirect evils in its train. In a number of counties the farmers have not had sufficient grain to fatten their stock, and have been obliged to sell them at ruinous prices; or, hoping to bring their animals through the winter, and disappointed by its unprecedented and prolonged severity, they have seen their stock die off without power to avoid the calamity. In some counties, and especially south of the Dent county line, the distress has been so great that the Legislature was appealed to for aid in keeping the sufferers from actual starvation, but a bill appropriating $50,000 for this purpose failed to pass both Houses.

ITS FOOD PLANTS.

It may be stated as a rule, which admits of very few exceptions, that the Chinch Bug is confined to, and can subsist only on, the juices of the grasses and cereals; its original food, when the red man ruled the land, being the wild grasses.* All accounts, therefore—and such accounts are coming to me constantly—of chinch bugs injuring grape vines, potatoes, etc., are based on the error of persons who mistake for the genuine article some one or other of the species which will be presently referred to as bogus or false chinch bugs. It is true that Packard, in his "Guide to the Study of Insects," says, in speaking of the Chinch Bug, that "they also attack every description of garden vegetables, attacking principally the buds, terminal shoots, and most succulent growing parts of these and other herbaceous plants;" but this statement is the result of bad compilation, the language, which is quoted from Harris, having reference, in the original, to the Tarnished Plant Bug (*Capsus oblineatus* Say), which, as may be seen from my second report, (p. 114), really has such an omnivorous habit. Though, therefore, the subject of our present sketch is restricted to certain families of plants, yet it manifests a decided preference for some of the grains over others. Thus it shows a great predilection for Hungarian grass; while of the more important cereals it is most severe on spring wheat and barley.

---

*I have found the young around the roots of strawberry plants, under circumstances which lead me to believe that they can feed upon this plant.

MODE OF REPRODUCTION AND HIBERNATION.

"Most insects—irrespective of the Order to which they belong—require 12 months to go through the complete cycle of their changes, from the day that the egg is laid to the day when the perfect insect perishes of old age and decrepitude. A few require 3 years, as for example the Round-headed Apple-tree Borer (*Saperda bivittata* Say) and the White Grub which produces the May-beetle (*Lachnosterna quercina* Knoch.) One species, the Thirteen-year Locust (*Cicada tredecim* Riley), actually requires 13 years to pass from the egg to the winged state; and another, the Seventeen-year Locust (*Cicada septemdecim* Linn), the still longer period of 17 years. On the other hand there are not a few that pass through all their three states in a few months, or even in a few weeks; so that in one and the same year there may be 2, 3 or even 4 or 5 broods, one generated by the other and one succeeding another. For example, the Hessian Fly (*Cecidomyia destructor* Say), the common Slug-worm of the Pear (*Selandria cerasi* Peck), the Slug-worm of the Rose (*Selandria rosæ* Harris), the Apple-worm and a few others, produce exactly two generations in one year, and hence may be termed "two-brooded." Again, the Colorado Potato-beetle in Central Missouri is three-brooded, and not improbably in more southerly regions is four-brooded. Lastly, the common House-fly, the Cheese-fly, the various species of Blow-flies and Meat-flies, and the multifarious species of Plant-lice (*Aphidæ*) produce an indefinite number of successive broods in a single year, sometimes amounting, in the case of the last named genus, as has been proved by actual experiment, to as many as nine.

"As long ago as March, 1866, I published the fact that the Chinch Bug is two-brooded in North Illinois (*Practical Entomologist*, I, p. 48), and I find that it is likewise two-brooded in this State, and most probably in all the Middle States. Yet it is quite agreeable to analogy that in the more Southern States it may be three-brooded. For instance, the large Polyphemus Moth is single-brooded in the Northern and Middle States, and yet two broods are sometimes produced in this State, while in the South it is habitually two-brooded. Again, the moth known as the Poplar Spinner (*Clostera Americana* Harris), is stated by Dr. Harris and Dr. Fitch to be only single-brooded in Massachusetts and New York, the insect spinning up in September or October, passing the winter in the pupa state, and coming out in the winged form in the following June. But Dr. Harris—no doubt on the authority of Abbott—states that 'in Georgia this insect breeds twice a year;'* and I have proved that it does so breed in Missouri."

"It is these two peculiarities in the habits of the Chinch Bug, namely, first, its continuing to take food from the day of its birth to the day of its death, and, secondly, its being either two-brooded or many-brooded, that renders it so destructive and so difficult to combat. Such as survive the autumn, when the plants on the sap of which they feed are mostly dried up so as to afford them little or no nourishment, pass the winter in the usual torpid state, and always in the perfect or winged form, under dead leaves, under sticks of wood, under flat stones, in moss, in bunches of old dead grass or weeds or straw, and often in cornstalks and cornshucks.

"In the winter, all kinds of insect-devouring animals, such as birds, shrew mice, etc., are hard put to it for food, and have to search every hole and corner for their appropriate prey. But no matter how closely they may thin out the chinch bugs, or how generally those insects may have been starved out by the autumnal droughts, there will always be a few left for seed next year. Suppose that there are only 2,000 chinch bugs remaining in the spring in a certain field, and that each female of the 2,000, as vegetation starts, raises a family of only 200, which is a low calculation. Then—allowing the sexes to be equal in number, whereas in reality the females are always far more numerous than the males—the first or spring brood will consist of 200,000, of which number 100,000 will be females. Here, if the species were single-brooded, the process would stop for the current year; and 200,000 chinch bugs in one field would be thought nothing of by the Western farmer. But the species is not single-brooded, and the process does NOT stop here. Each successive brood increases in numbers in geometrical progression, unless there be something to check their increase, until the second brood amounts to twenty millions, and the third brood to two thousand millions. We may form some idea of the meaning of two thousand millions of chinch bugs when it is stated that that number of them, placed in a straight line head and tail together, would just about reach from the surface of the earth to its central point—a distance of four thousand miles."

WHERE THE EGGS ARE LAID.

The Chinch Bug deposits its eggs occasionally above ground on the blades of grain, but far more often, and normally, underground, upon the roots of the plants infested. These eggs are three-hundredths of an inch long, elongate-oval, pale amber-colored and with one end squarely docked off and ornamented with four little tubercles near the centre. (Fig. 3, *a.*) They are deposited in little clusters, and the young lice hatching from them are at first bright red and remain for a considerable time underground, sucking the sap from the roots. A wheat plant pulled from an infested field in the spring of the year, will generally reveal hundreds of these eggs attached to the roots, and at a somewhat later period, the young larvæ will be found clustering on the same, and looking like so many moving red atoms. As the sequence will show, it is practically quite important that we know the whereabouts these eggs are deposited; yet they are so small and so difficult of detection that the wildest theories were promulgated as to the origin and birth of chinch bugs, until the question was settled by the entomologist with his lens and microscope. The female occupies from two to three weeks in depositing her eggs; the egg requires about two weeks to hatch, and the bug becomes full-grown and acquires its wings in five or six weeks from hatching.

---

* *Injurious Insects*, p. 434.

Individuals may be found of all sizes and ages throughout the summer months, yet the great body of the first brood mature soon after the ripening of spring wheat.

Insects generally lay all their eggs in single masses and in a comparatively brief time: in other words, the eggs in the ovaries are almost simultaneously developed, and the female devotes the last of her life to the single and comparatively brief act of oviposition, and then perishes from exhaustion. In the Chinch Bug, however, as in the Colorado Potato-beetle, Plum Curculio, etc., the ova continue to develop for several weeks, and the eggs are laid from day to day in small numbers.

FLIGHT OF THE CHINCH BUG.

Though, as we have already seen, there is a dimorphous, short-winged form, incapable of flight, and found more particularly in northern latitudes, the normal, long-winged form is abundantly able to fly, and is sometimes seen swarming in the air. This flight is most noticeable at three periods in the year. First, during the early warm days of Spring, when—issuing from their winter quarters—the individuals of the second or hibernating brood perform their courtships, and the females scatter over the wheatfields and seek the driest and most open soil, that they may penetrate to the roots of the plants and there consign their eggs. Secondly, in July, after wheat is harvested, and the great body of the first brood have acquired wings and are performing their courtships and scattering over cornfields and meadows. Thirdly, during the latter sunny days of Fall, when the mature individuals of the second brood are seeking their winter quarters, and many of them already making love preparatory thereto.

ITS MIGRATION ON FOOT.

Although the Chinch Bug is abundantly able to fly, yet as a rule it does not take to wing readily. Indeed, between the periods of flight mentioned above, these insects are, for the most part, unable to fly, for the simple reason that they are in the adolescent growing stages, and have not yet acquired wings; for no insect acquires wings until it has attained the imago or full grown state. Thus in migrating from a field of grain after it has been reduced and exhausted, or in passing from a wheatfield to a cornfield, after the wheat has been cut, these myriad sappers and miners are forced to march on foot, and they often do so in solid columns, inches deep. In such case the few more early matured individuals, which have wings, generally keep with the crowd and show no inclination to use their recently acquired power of flight.

HEAVY RAINS DESTRUCTIVE TO THE CHINCH BUG.

"As the Chinch Bug, unlike most other true bugs, deposits its eggs underground, and as the young larvæ live there for a considerable time, it must be manifest that heavy soaking rains will have a tendency to drown them out. The simple fact, long ago observed and recorded by practical men, such as Mr. B. E. Fleharty, of North Prairie, Knox county, Ill., that this insect scrupulously avoids wet land, proves that moisture is naturally injurious to its constitution. Hence it was many years ago remarked that very often when spring opens dry, chinch bugs will begin to increase and multiply in an alarming manner; but that the very first heavy shower checks them up immediately, and repeated heavy rains put an almost entire stop to their operations. It is very true that nearly all insects will bear immersion under water for many hours, and frequently for a whole day, without suffering death therefrom; for although animation is apparently suspended in such cases, they yet, as the phrase is, 'come to life again.' But no insect, except the few that are provided with gills like fishes and extract the air out of the water, instead of breathing it at first hand, can stand a prolonged immersion in water without drowning—and it must be obvious to the meanest capacity that an insect such as the Chinch Bug, whose natural home is the driest soil it can find, will have its health injuriously affected by a prolonged residence in a wet soil.

"In fact, the whole history of the Chinch Bug, from the very earliest records which we have of it, points unmistakably to the fact that a wet season affects it injuriously, and often almost annihilates it. In Carolina and Virginia, during the dry years which preceded 1840, it had become so numerous that the total destruction of the crops was threatened; but fortunately, unlike its predecessors, the Summer of 1840 was quite wet, and the ravages of the bug were at once arrested. In Illinois and in this State it had increased to an alarming extent during the latter part of the last rebellion; but the excessive wet Summer of 1865 swept them to such an extent that it was difficult to find any in the Fall of that year. So it was again in 1869–70, and so it always has been and doubtless will be."

It will be remembered that in some parts of the State we had several generous rains in July which were most grateful after the preceeding excessively dry weather. No one who was not in and about the cornfields can have any idea of the almost magic effect of those rains in destroying the chinch bugs. Of the vast swarms that a few weeks before, had blackened and deadened the rows of corn adjacent to harvested wheatfields, fully two-thirds in many localities were dead and rotting, whether above the ground between the blades, or below ground upon the roots; and these dead and drowned comprised bugs of all ages, and especially the larvæ and pupæ.

DIRECT REMEDIES AGAINST THE CHINCH BUG.

When a field of wheat or barley or rye, is once overrun by chinch bugs, man is, in the majority of cases, powerless before the unsavory host, and his only hope is in timely rains. The great majority of noxious insects may be controlled even at the last hour, but a few—and among them is the Chinch Bug—defy our efforts when once they are in full force upon us. There are several applications that will kill the insect when brought in contact with it, and I have known a few rows of corn to be saved by the copious use of simple hot water, but the application of all such direct remedies becomes impracticable on the scale in which they are needed in the grain fields of the West. Irrigation, where it can be be applied—and it can be in much of the territory in the vicinity of the Rocky Mountains, where the insect commits sad havoc; and with a little effort, in many regions in the heart of the Mississippi Valley—is the only really available, practicable remedy, after the bugs have commenced multiplying in the spring. *I wish to lay particular stress on this matter of irrigation*, believing as I do, that it is an effectual antidote against this pest, and that by overflowing a grain field for a couple of days, or by saturating the ground for as many more in the month of May, we may effectually prevent its subsequent injuries. In the article on the Rocky Mountain Locust, I may have something more to say on this matter of irrigation. We cannot, at the critical moment, expect much aid from its natural enemies, for these are few, and attack it mostly in the winter time. We must, therefore, in our warfare with this pest, depend mainly on preventive measures where irrigation is impossible.

PREVENTIVE MEASURES.

It has been repeatedly shown in these pages, that in no department of science does the old proverb, "prevention is better than cure," apply with such force as in economic entomology; for there are hosts of insects whose depredations may be averted with the utmost ease, when we understand their weak points and attack them at the proper place or time. Though we are powerless before the Chinch Bug at the time it commits the greatest injury, and attracts most attention, yet I shall endeavor to show that it may, for all practical purposes, be outflanked by judicious husbandry and proper precautionary steps.

BURNING—It has long been noticed that the Chinch Bug commences its ravages in the Spring from the edges of a piece of grain, or occasionally from one or more small patches, scattered at random in the more central portions of it, and usually dryer than the rest of the field. From these particular parts it subsequently spreads by degrees over the whole field, multiplying as it goes, and finally taking the entire crop unless checked up by seasonable rains. In newly broken land, where the fences are new, and consequently no old stuff has had time to accumulate along them, the Chinch Bug is seldom heard of. These facts indicate that the mother insects must very generally pass the winter in the old dead stuff that usually gathers along fences. Hence, by way of precaution, it is advisable, whenever possible, to burn up such stuff in the winter, or early in the spring, and particularly to rake together and burn up the old corn stalks in the fall of the year, instead of plowing them in, or allowing them, as is often done, to lie littering about on some piece of waste ground. Agriculturally speaking, this may not be the best way of enriching the soil; but it is better to lose the manure contained in the corn stalks than to have one's crop destroyed by insects. Whenever such small infected patches in a grain field are noticed early in the season, the rest of the field may often be saved by carting dry straw on to them, and burning the straw on the spot, Chinch Bugs, green wheat and all; and this will be still easier to do when the bugs start along the edge of the field. If, as frequently happens, a piece of small grain is found about harvest time to be so badly shrunken up by the bug as not to be worth cutting, the owner of it ought always to set fire to it and burn it up along with its ill-savored inhabitants. Thus, not only will the insect be prevented from migrating on to the adjacent corn-fields, but its future multiplication will be considerably checked.

As was clearly shown by Dr. LeBaron, in his second report as State Entomologist of Illinois, much of the efficacy of burning corn stalks will depend on the manner in which it is performed and the time of year of its performance. The approach of Winter finds the bugs scattered everywhere over our corn-fields. But the fields themselves afford very little Winter shelter, and though standing corn stalks may harbor the bugs more or less throughout the Winter, the fact remains that the majority of the bugs leave them and seek greater shelter and more favorable quarters. Thus, to be effectual, the stalks should be cut and burned before Winter sets in; or what is preferable, shocks should be made at intervals to attract the bugs. The bugs will then congregate in these shocks and may there be burned at any time during the winter. In this connection I will quote the following inquiry from Mr. J. T. Moulton, Jr., of St. Francois county:

> The most compact and destructive army of chinch bugs I ever saw, started from sorghum bagasse, which had been used as manure. Might the insects be trapped to any extent worth mentioning, by exposing heaps of rubbish in conspicuous places in August, and burning the same in November? Would a great proportion of the eggs be found in such heaps?

The eggs would of course not be found in such heaps, as they are laid only on the living grain, and principally below the surface of the ground at the crown or on the roots of the plant. But they would nevertheless be effectually destroyed in the manner you suggest, because each female bug sheltering under the bagasse carries within her ovaries a number of undeveloped eggs which, as soon as Spring opens, she is ready to consign to the roots of young grain. The plan suggested by Mr. Moulton is therefore a capital one; and it matters little whether bagasse, corn-stalks, or any other rubbish be used, so long as the heaps are not too large and compact, and are placed and destroyed by fire at the times mentioned.

Where the custom of allowing cattle to range during the winter in the husked corn-fields, even the few chinch bugs which secrete in these stalks are apt to get killed by the feeding and tramping.

ROLLING—As the mother Chinch Bug has to work her way under ground in the spring of the year, in order to get at the roots upon which she proposes to lay her eggs, it becomes evident at once that the looser the soil is at this time of the year the greater the facilities which are offered for the operation. Hence the great advantage of plowing land for Spring grain in the preceding Autumn, or, if plowed in the Spring, rolling it repeatedly with a heavy roller after seeding. And hence the remark frequently made by farmers, that wheat harrowed in upon old corn ground, without any plowing at all, is far less infested by Chinch Bug than wheat put in upon land that has been plowed.

INVIGORATING THE PLANT BY MANURE: EARLY SOWING, ETC.—It has long been observed that Fall wheat suffers less than Spring wheat from this insect, for the simple reason that it generally matures before the bugs have attained their greatest power for harm. The Tappahannock wheat, on account of its early ripening, is, for this reason, one of the safest kinds to grow. There is also a strong impression among those who have had a good deal of experience with the insect, that it thrives best on sickly and weakly grain. While in such questions it is always somewhat difficult to distinguish between cause and effect, the following experience of that close observer, Mr. J. R. Muhleman, of Woodburn, Illinois, would certainly seem to show that the bugs do show some choice of food in a corn-field:

> I had a piece of very vigorous corn opposite my neighbor's wheat, and after it was harvested, that corn nearest the wheat became black with bugs. Now, the small field on which I raised my corn, is various in quality, ranging from rich to barren. My supply of manure did not hold out to cover all the latter, so that the corn thereon grew but slowly and remained weak. About a week after I had first noticed the bugs on that strong fast-growing corn, as mentioned above, I passed again by it, and found the bugs had abandoned it. That corn, and that which grew on the manured portions of the field remained free from the bugs during the remainder of the season, and I began to think the bugs had left entirely; that corn turned out well—as well as it promised in the forepart of the season.
>
> At the time of cutting the corn I became undeceived, for I found all the *weak* corn full of the stinkers, suggesting to me that they had thus abandoned the big heavy stalks, because, as I suppose, the sap flowed too fast for their comfort, and they went at the more etiolated, slowly growing corn. Upon frequent inquiry in different parts of the county, I have found that corn growing in bottoms was comparatively free from the bugs and made good corn, while upland corn, and especially such grown on rather thin land, was destroyed by them.
>
> The lesson I would therefore draw from these observations is, that early planting, manuring, and close attention in cultivation, especially on uplands of poor soil, will reward the tiller with a reasonable yield, as far as the Chinch Bug is concerned.

There can be no doubt as to the soundness of the lesson my friend draws in the last paragraph, and much of the freedom from chinches that has been noticed to follow the steeping of the seed in brine, or the use of salt and lime on the soil, may be traced to the vigor which the applications gave to the plants.

MIXING SEED OR PROTECTING ONE PLANT BY ANOTHER.—A strip of Spring wheat might be sown around a field of Fall wheat, as suggested by Mr. Carr (see Appendix), so that when the bugs have sucked it dry, or as soon as the Fall wheat is cut, and before they have started for other fields, the Spring wheat with its contents may be burned. Other preventive measures of this character have been tried, such as the sowing of a rod or two of Hungarian grass or millet around a wheat field, with a view of satisfying the bugs till the desired crop is out of danger. I have also known some to practice planting a few rows of sorghum, which is tougher than the corn. The bugs remain on the sorghum till ready to scatter by wing, when there is little danger to the corn, because it is then too strong and vigorous to be much affected by the young of the second brood.

PREVENTING THE MIGRATION OF THE BUGS FROM ONE FIELD TO ANOTHER.—When, after having exhausted a field of grain, they are marching to another; or when, after wheat is cut, they are making in close columns for the nearest corn, they may be checked in their progress in the following manner, which I give in the words of Mr. H. J. Everett, of Stoughton, Wisconsin, who first recommended it:

> Take common fence boards, six inches or less wide, and run them around the piece, set edgewise, and so that the bugs cannot get under them or between the joints, and then spread either pine or coal tar on the upper edge, and they will not cross it. The tar needs renewing until the edge gets saturated, so that it will keep wet and not dry in any more, and either kind of tar is effectual. Then dig holes close to the board, about like a post hole, once in four or five rods, and run a strip of tar from the top of the board to the bottom on the outside, opposite the hole, and they will leave the board, and in trying to get around the tarred stripe, will slide into the hole, where they will be obliged to remain till they can be buried at leisure, and new holes opened for more victims. It is seldom one has to fence more than one side of the field, but wherever the fence is it is a sure stop.

With a little care to keep the tar moist by renewal, the boards may be dispensed with, and the tar poured out of the kettle onto the ground. About a gallon is required to a rod, and it should be renewed every other day, or oftener when rains prevail, until the bugs are destroyed in the manner before indicated. According to Dr. LeBaron, this plan was extensively resorted to in 1871, around Bloomington, Illinois, where the coal tar could be easily obtained, and it gave most satisfactory results. The same end may be attained by plowing a deep furrow or two at a short distance one from the other around a field it is intended to protect; and from the ease and cheapness with which this plan is executed, it is likely to become the most popular. The earth should be thrown away from the protected field, and the furrow not allowed to settle or harden, but be kept friable or dusty by dragging a log or a stone or a bundle of brush along it each morning. The philosophy of the plan is that the bugs cannot climb up the loose surface, especially on the perpendicular side. The dragging each morning will kill many, but they should be either trapped and destroyed in pits as already described, or burned by strewing straw each morning on the invading side of the furrow, and burning the same each evening, when a chinch bug holocaust will result.

IMPORTANCE OF WINTER WORK AND COMBINED ACTION.

Measures such as these last are, however, but partially preventive; we destroy the enemy only after he has just committed his principal ravages. Those, therefore, which strike at the right place and prevent the bug from doing any injury, are by far the most important and valuable; and I cannot lay too much stress on the importance of Winter work in burning cornstalks, old boards and all kinds of grass, weeds, rubbish and litter around grain fields, and even the leaves in the adjacent woods, in and under all of which the little pest hibernates. Next to drowning out the rascals, cremation is undoubtedly the most effectual mode of destruction. Next, let Spring wheat be got in as early as possible, and let it be rolled. The rolling will apply equally well to the culture of Winter wheat, though I would not advise the early Fall planting of this last in sections where it is likely to suffer from Hessian fly, for reasons not pertinent in this connection. Sow thickly, as the more the ground is shaded the less the Chinch Bug likes it. If in late Winter the bugs are known to be numerous so as to bode future injury—and the fact can easily be ascertained by the ill-savored odor they send up from corn-shocks and by their general presence in the wintering places mentioned—it will be well to plant no Spring wheat or barley. In short, just in proportion as we adopt an intelligent and cleanly system of culture, just in that proportion will the Chinch Bug become harmless: it is, in a great part, and in its more injurious aspects, a result of slovenly husbandry, and will lose its threatening character in the more western States, as it has in those to the east of us, just as fast as more careful and intelligent husbandry becomes the fashion. Combined effort is, also, most important in this connection, and it is by producing unity of action in such cases that the granges can demonstrate, in no small degree, the good that is to flow from organization. While the farmers were uncombined they were as weak as a rope of sand in matters requiring this combined effort, but with the powerful organization now existing among them, they will be better able to cope with their foes of whatever nature.

Every one who has traveled over our own State, must have been struck with the manner in which some fields were rendered almost worthless by this insect; while others in the immediate vicinity, and sometimes not more than a quarter of a mile away, were entirely exempt from its injuries. I have had no difficulty in accounting for these circumstances in the light of what is here stated.

Much good winter work may be done also in the way of trapping the bugs. In seeking winter quarters, they show a decided partiality for any flat substances, such as old boards, that do not rest too closely upon the ground. If all old boards that can be obtained are laid around a field, in the Fall, in such manner that the larger part of the lower surface will not quite rest on the ground—which of course it will not do if the ground is in the least bit uneven or covered with grass—the bugs will congregate under such traps, and during the cold weather of Winter may be scraped from them on to dry straw and burned.

In this connection, and to show the folly of waiting till the last moment, I take the liberty of publishing the following letter as a sample of many that reach me about harvest time:

DEAR SIR: I once noticed in the Kansas agricultural reports an article from your pen on noxious insects, and how to destroy them, and a few days since I read in the St. Louis *Globe* of the good work you were doing. I now write to you in the hope that you can do as good a turn for a sad lot of farmers as you did for Mr. Whittaker.

We are being eaten out by the Chinch Bug; Spring wheat and barley utterly ruined—none left to eat; Winter wheat damaged one-half, and whole fields of corn being laid waste. I hear of many instances where from ten to fifteen acres are gone, and the bugs marching steadily on. A few persons are trying to stop them by spreading straw in their way and burning or dragging logs; some are trying coal tar; but generally the bugs are marching onward.

I look from my window on a fine, large field of oats over half ruined. Many are cutting oats in the bloom or milk to save something.

I have seen grasshoppers twice, and would prefer them of the two. If you can tell us something about them and how to prevent their ravages, drive off or destroy them, you will confer upon us the greatest favor and receive our heartfelt thanks.

Wishing you God-speed in your noble efforts to help our insect-cursed country,

I am, with respect,
H. V. NEEDHAM,
Master of Grange No. 71, P. of H.

SUMMIT, Kansas.

All such letters, when they come from citizens of Missouri, I make it a point to answer, as far as other duties will permit; but from the rather lengthy account of the Chinch Bug here given, it is obvious that relief in all cases like that of Mr. Needham, is sought at the last moment, when it cannot be got except through providential rains or irrigation. Yet it is always at this last moment that the cry of distress goes up from the large body of farmers, or that any efforts are made to avert it, except by the few who have been properly informed and understand the habits of the enemy. That these last form but a small (though I am happy to say constantly increasing) portion of the agricultural community is, perhaps, to be regretted. A practicable, everywhere available, cheap remedy, that would give relief at this critical period, is from the nature of the case, hardly to be hoped for. Yet it is not an impossibility; and if I could devote to the effort my whole time for one single year, with the means to test on a large scale, thoroughly and effectually, the many different methods that suggest themselves to my mind—as the use of sulphate of copper or of iron; of carbonic acid gas or of sulphuret of carbon—something might come out of the list of possible remedies, and thousands of dollars might be cheaply expended in the attempt where such large interests are involved. Regarding the use of carbonic acid gas, it is probable that it would destroy the bugs on a hill of corn, if thrown on to them at a distance of not more than two feet; but from experiments which I made upon chinches with a Babcock extinguisher, I am of the opinion that little can be expected from its use as thrown from this machine. The gas escapes too rapidly to be of any great practical service, and has no effect on the bugs when thrown in a jet five feet long.

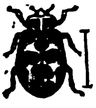
ABSTAINING FROM THE CULTIVATION OF THE GRAINS UPON WHICH THE INSECT FEEDS.—On the principle that it is better to save the labor and seed than to lose both and the harvest withal, the idea of quitting the culture of the cereals, and especially of Spring wheat and barley, for a year or two, as a means of preventing the breeding of the insect to any injurious extent, has often been considered and discussed. There is some reason to believe that the abandonment, for a single year, of barley and Spring wheat culture, over a sufficiently large extent of country—as, for instance, over a whole county—would cause a sufficient reduction in the numbers of chinch bugs in such a county, as to insure fair crops for two or three succeeding years; and such a course is well worth trying. It is to be feared, however, that it will never be carried out in concert over a sufficiently extended breadth of country; 1st, because the farmer can never foretell the character of the coming season, on which the increase or decrease of the pest so largely depends, and will naturally hope for the best; 2d, because if neither Spring nor Fall wheat, barley, oats, rye, Hungarian grass, timothy nor corn were grown for one season in any given county where there are wild prairie grasses, the Chinch Bug would yet breed, though not so numerously.

NATURAL ENEMIES.

Practically we have not much to hope for from the natural enemies of this bug; for they are neither numerous nor efficient enough to make any material impression on the vast army of chinches which invade our grain fields; neither are they of such a nature as to be greatly encouraged, or artificially multiplied for man's good, as in wholesale measures of destruction it is impossible to separate the sheep from the goats. Yet it will afford some satisfaction to the farmer to be able to recognize even these few friends which assist, in their quiet way, to keep his inveterate foe in check.

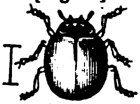
"As long ago as 1861, Mr. Walsh, in his *Essay upon the Injurious Insects of Illinois*, published facts which tended to show that four distinct species of Ladybirds preyed upon the Chinch Bug.* The first of these four is the Spotted Ladybird (*Hippodamia maculata*, DeGeer, Fig. 5), which also preys upon a great variety of other insects, attacking both the eggs of the Colorado Potato-beetle and those of certain Bark lice.

[Fig. 5.]



SPOTTED LADYBIRD.

[Fig. 6.]



TRIM LADYBIRD.

"In corroboration of the fact of its preying on the Chinch Bug, I may state, that the Rev. Chas. Peabody, of Sulphur Springs, informs me that he has repeatedly found it so feeding on his farm. The second species is the Trim Ladybird (*Coccinella munda* Say, Fig. 6), which is distinguishable at once from a great variety of its brethren by having no black spots upon its red wing-cases. The other two are much smaller insects, belonging to a genus (*Scymnus*) of Ladybirds, most of the species of which are quite small and of obscure brown colors, and hard to be distinguished by the popular eye from other beetles, the structure of which is very different, and which therefore belong to very different groups and have very different habits.

"In the Autumn of 1864, Dr. Shimer ascertained that the Spotted Ladybird which has been sketched above, preys extensively upon the Chinch Bug. In a particular field of corn, which had been sown thick for fodder, and which was swarming with chinch bugs, he found, as he says, that this Ladybird, 'could be counted by hundreds upon every square yard of ground after shaking the corn; but the chinch bugs were so numerous that these hosts of enemies made very little perceptible impression among them.'

"In the same Autumn Dr. Shimer made the additional discovery, that in the very same field of fodder-corn the chinch bugs were preyed upon by a very common species of Lacewing-fly, which he described in January, 1865,† as the Illinois Lacewing (*Chrysopa Illi-*

---

*See *Trans. Ill. St. Agric. Society*, IV, pp. 346-9.

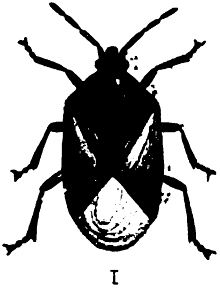
† Proc. Ent. Soc. Phil., IV, pp. 208-12.

noiensis). The description was republished, together with the substance of Mr. Shimer's observations in the *Prairie Farmer*, of Chicago, Ill., accompanied with a non-characteristic wood-cut of the larva, cocoon and imago. At this time Mr. Shimer favored me with two specimens of the perfect insect, and he likewise furnished Mr. Walsh with additional specimens. From these specimens, it is evident that the species is the same as that described long before, by Dr. Fitch, as the Weeping Lacewing (*Chrysopa plorabunda*). In 1868, I found the same species quite numerous in a wheat-field belonging to Mr. T. R. Allen, of Allenton, where its larvæ were perhaps feeding on the chinch bugs, as they were found to do in North Illinois, by Dr. Shimer. The Lacewing-flies all bear a striking resemblance to one another, both in size, shape and color. They almost all of them, in fly state, have a characteristic and disagreeable odor, resembling nothing so much as human ordure. (For further details see Rep. 1, pp. 57–8, and Rep. 6, Fig. 10).

"According to Dr. Shimer, the Weeping Lacewing-fly was not quite as abundant as the Spotted Ladybird among the fodder-corn, but still there were so many of them, that he thought that 'there was one or more of them for every stalk of that thickly sown corn.' 'Every stroke of the cutter,' he adds, 'would raise three or four dozen of them, presenting quite an interesting spectacle as they staggered along in their awkward, unsteady flight.' And he not only actually observed the larvæ preying very voraciously on the chinch bugs in the field, but he reared great numbers of them to the mature fly by feeding them upon chinch bugs. His account of the operations of the larva when in captivity is so interesting that I quote it in full:

> I placed one of the larvæ in a vial, after having captured it in the field in the very act of devouring chinch bugs of all sizes, and subsequently introduced into the vial a number of chinch bugs. They had hardly reached the bottom before it seized one of the largest ones, pierced it with its long jaws, held it almost motionless for about a minute while it was sucking the juices from the body of its victim, and then threw down the lifeless shell. In this way, I saw it destroy in quick succession, about a dozen bugs. Towards the last, as its appetite was becoming satiated, it spent five or more minutes in sucking the juices from the body of one bug. After this bountiful repast, it remained motionless for an hour or more, as if asleep. Never for a single moment, during the feast, did it pause in the work. When not in possession of a bug, it was on the search for, or in the pursuit of others. It manifested much eagerness in the pursuit of its prey, yet not with a lion-like boldness; for on several occasions I observed a manifest timorousness, a halting in the attack, as if conscious of danger in its hunting expeditions, although here there was none. Sometimes, when two or more bugs were approaching rapidly, it would shrink back from the attack, and turning aside go in the pursuit of others. At length, awakening, it would renew the assault as before. On one occasion, when it was on the side of the vial, two inches up, with a large bug in its mouth, I jarred the vial, so that it fell to the bottom and rolled over and over across the bottom, but holding on to its prey, it regained its footing and mounted up to its former position. Occasionally the chinch bugs would hasten to escape when pursued, as if in some degree conscious of danger.

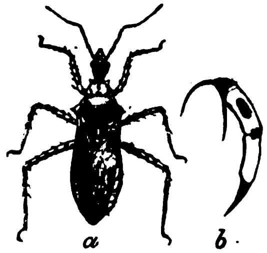
[Fig. 7.]



INSIDIOUS FLOWER-BUG.

The Insidious Flower-bug (*Anthocoris insidiosus*, Say, Fig. 7.) which is so often found preying on the leaf-inhabiting form of the Grape Phylloxera, and which is not unfrequently mistaken for the Chinch Bug, is quite commonly found in connection with this last, and in all probabitity preys upon it.

[Fig. 8.]



MANY-BANDED ROBBER.

The Many-banded Robber (*Harpactor cinctus*, Fabr. Fig. 8.), also preys upon the Chinch Bug. It is quite frequently met with and I have detected it in the act.

"The common Quail of the Middle and Western States (*Ortyx Virginiana*) otherwise known as the Partridge in the Northern States, has long since been known as a most efficient destroyer of chinch bugs, and the fact was some time ago published by myself in the *Prairie Farmer*, and by others in various agricultural journals and Reports. We also have the corroborative testimony of Dr. Shimer, who is a good ornithologist. In the Winter time, when hard pushed for food, this bird must devour immense numbers of the little pests which winter in just such situations as are frequented by the Quail; and this bird should be protected from the gun of the sportsman in every State where the Chinch Bug is known to run riot." It is gratifying to know that this fact has become sufficiently recognized to have gained for the bird legislative protection in Kansas. Prairie chickens are also reported as devouring it, but I do not know that any absolute proof has been given. Mr. J. W. Clarke, of Green Lake county, Wis., also reports seeing the Red-winged Blackbird feeding on it.* Finally, Mr. B. W. Webster, of Austin, Cass county, and G. C. Brackett, Secretary of the Kansas State Horticultural Society, have both written me to the effect that ants destroy its eggs.

POSSIBLE REMEDIAL AND PREVENTIVE MEASURES THAT NEED FURTHER AND THOROUGH TRIAL.

There are a number of *possible* remedies or preventive measures that suggest themselves to any one having a thorough acquaintance with the insects' economy, the thorough trial and test of which will require much time, labor and expense. There are others which are from year to year continually recommended on pretty good authority.

**Prairie Farmer*, April 9, 1870.

None of them can be recommended with any assurance; yet it will be well to enumerate a few of the more plausible, as worthy of more thorough trial, in the hope that some of our Western Agricultural Colleges, having the opportunities and facilities, will be induced to carry out such a system of carefully conducted experiments, as will forever settle the question of their utility—a system which it is impossible for the State Entomologist of Missouri to carry out, with present means and duties.

In June, 1871, Mr. Wm. F. Talbott, of Richmond, Ills., strongly recommended in the columns of the *Missouri Republican* the use of salt and brine—the salt to be sown with the seed at the rate of about a half barrel to the acre and the brine to be poured on the plants. The recommendation was extensively copied, but subsequent trial has proved that the bugs are not particularly affected by it. Yet as a fertilizer and by invigorating the plant and hastening its maturity so that it will ripen before the insect acquires the greatest power for harm, such an application may prove highly beneficial; and this fact will account no doubt for some of the favorable reports of the use of salt. The same may be said of lime and gas lime which have been extolled by some and denounced by others as chinch bug antidotes.

There is a very general impression that hemp is obnoxious to the Chinch Bug, and no end of instances are reported where grain crops surrounded or interspersed with it have been unmolested, while other adjacent fields have been injured. The testimony is, however, somewhat conflicting. Flax, too, is recommended as having the same power of protecting from chinch bug ravages; and Mr. S. T. Kelsey, of Hutchinson, Kans., who is abundantly able to judge intelligently, and has had good opportunity so to judge, reports that last year, in Kansas, small grain planted on ground where flax was grown the previous year, generally escaped damage from the bugs. He recommends sowing with wheat and other grains, one or two quarts of flax seed per acre. "It can be put in early in the spring, even with fall wheat by a light harrowing and rolling, (if a roller can be had) so as to not damage the grain. Its growth could not materially injure the crop, and if the seed ripened it could be easily separated. Some people sow flax and barley mixed on the same ground, separate the seed in cleaning, and claim that it pays better than sowing either one alone. If flax is really offensive to the Chinch Bug, so that they will not stay around it, why may we not "flax" the pests out of our grain fields entirely?"*

---

* *Kansas Farmer*, January 13, 1875.

Mr. Alfred Gray, the enterprising Secretary of the Kansas State Board of Agriculture, who has made a number of official inquiries, gets substantially the same favorable reports as to the influence of flax.

A similar influence is claimed for castor beans and even for buckwheat; and some years back Mr. Erwin, Agricultural editor of the Fulton (Mo.,) *Mail*, informed me that, having once gotten a poor stand of corn, he harrowed it and sowed to buckwheat. The Chinch Bug almost destroyed the rest of his corn, but did not work on this piece. The tendency of buckwheat to keep the ground moist may throw some light on this experince.

It has been recommended to sow with each 12 bushels of winter wheat, one bushel of Winter rye; and with Spring wheat the same proportion of Winter wheat—with the idea, I suppose, that the bug prefers the young to the old plants. There is little harm in the methods and they are worthy of further trial.

There are a great many other proposed remedies that appear in the columns of our agricultural journals each year—some of them utterly absurd and founded on ignorance; others of doubtful utility, because founded on isolated experience, where too often it is evident that cause and effect have not been properly understood. It is needless to instance them. As to the ridiculous proposal put forth in the Waukegan, Ills., *Gazette* in 1865, with a great blowing of trumpets, by one D. H. Sherman, of that town, namely, to destroy the Chinch Bug in the egg state by pickling all the seed wheat, it is sufficient to observe that this insect never deposits its eggs upon the kernel of the ripe wheat. Consequently, to attempt to kill chinch bug eggs by doctoring the seed wheat, would be pretty much like trying to kill the nits in a boy's head by applying a piece of sticking plaster to his great toe. In the old *Practical Entomologist*, nine years ago, I showed that there were no such eggs in the wheat kernels, which Mr Sherman himself had sent me, and which he had supposed to be thus infested. Of course the same remark applies to every other proposition to destroy this insects' eggs by manipulating the seed—however beneficial such measures may be as a means of invigorating the plants, causing an early start, or preventing rust and smut.

INJURIOUS TO STOCK.

Accounts reached me from several sources, and were common in the agricultural papers, of stock being injured when fed with corn fodder badly infested with the bug; and I have no reason to doubt that animals confined to corn-fodder in seasons when every corn-stalk harbors dozens or even hundreds of bugs, will suffer from eating them—the symptoms described being a falling off in flesh and constipation. *Verbum sat sapienti.*

PROGNOSTICATING.

After such a Chinch Bug season as we had in 1874, the question is continually asked during the Winter: "Will there be any chinch bugs next Summer?" It is impossible to give any satisfactory answer to such a question, because so much depends on the character of the approaching Spring. We had some very severe and continued cold weather this Winter, and many entertain the hope that the chinches have been frozen out. The farmer must lay no such unction to the soul, however; for it is not intense cold but changeable Winter weather—successive thawings and freezings—that injures and destroys the Chinch Bug.*

UNNECESSARY FEARS.

While some thus take a bright view often unwarranted by the actual facts, others again are unnecessarily pissimistic and hopeless of the future prospects—borrowing trouble where there is, perhaps, no cause for it. This fact may be illustrated by the following letter from Mr. Wm. H. Avery, of Lamar, Barton county, as a sample:

> About a month or six weeks ago, numerous farmers of this county reported finding large quantities of dead chinch bugs on the ground beneath shocks of corn. They were so numerous that double handfuls could be taken up without much effort, and many believed that all the bugs in the country were dead. One man said that he had observed that what appeared to be dead bugs were only the shells or outer covering of bugs, and he believed the bug itself had only escaped from its old covering.
>
> I have not heard of any living chinch bugs being seen for two or three months, though I have not made particular search.
>
> P. S. Since writing the foregoing, Dr. Dunn and I have made search in the fields for living chinch bugs and could find none, while dead ones are abundant.
>
> I send you, in another wrapper, a piece of corn-stalk containing the bugs just as we found them.

Now in the corn-stalk sent, though, on a superficial view, it appeared black with chinches, there was not a single living bug to be found. What had been mistaken for them was a mass of the empty pupa-skins. We have seen, in speaking of the insect's transformations, how, at each successive molt, the colors of the perfect bug are more and more approached, until in the pupa state, both in color and size, there is great resemblance to the mature bug. When about to undergo the last molt, i. e., to shed the pupa-skin, the insects in late

---

* Since this was written, I have found the Chinch Bug by millions in its Winter quarters, and on the 28th and 29th of March—the weather being quite warm—they already began to move and fly about. This shows that the long and severe Winter had little effect on them.

Summer and Fall, are fond of congregating on corn-stalks in the shelter afforded by the broad blades; and since all insects, in molting, fasten themselves as securely as possible, and as none of them that live by suction, like the Chinch Bug, ever devour their cast-off garments, as many of the mandibulate species are known to do, the cast-off pupa-skins in such corn-stalks remain indefinitely between the blades. Again, many chinch bugs naturally die in the Fall or in the Winter, either from disease or from having run their course; while in some years, as Dr. Shimer has conclusively shown, and as I can testify from personal examination, a very general fatality attends the hibernating bugs, so that it is difficult to find a living one. In all such cases, a little careful research by aid of an ordinary lens will soon enable the farmer to determine whether he is dealing with dead or living chinches, or only their skeletons. The pupa-skins, though distended, with every leg-covering perfect, readily reveal their mocking emptiness under the lens or by the pressure of the finger, and while, when numerous, they speak in unmistaken terms of the large numbers of chinches that came to maturity in the Fall, they bear no evidence of the present strength, nor furnish any clue to the future power of the foe: the dead bugs are generally covered with mold and are discolored and soft: the living ones are bright-colored, and will soon begin to kick and crawl on being brought into a warm room.

BOGUS CHINCH BUGS.

"Few things are more astonishing than the acuteness of perception superinduced by being constantly conversant with some one particular subject. I have often been surprised at the readiness with which nurserymen will distinguish between different varieties of Apple, even in the dead of the year, when there are no leaves, and of course no fruit on their nursery trees. In the same way old practiced shepherds can recognize every individual sheep out of a large flock, though, to the eyes of a common observer, all the sheep look alike. Experienced grain-growers, again, can distinguish at a glance between twenty different varieties of wheat, which the best botanist in the country would fail to tell one from the other; and I have been informed that a miller of many years' standing, as soon as he has shouldered a sack of wheat, knows at once whether it is Spring grain or Fall grain; while ninety-nine entomologists out of every hundred would probably be unable, on the most careful inspection, to tell the difference between the two, and some might even mistake wheat for rye.

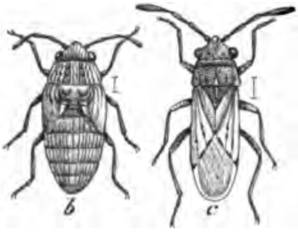
"It is not surprising, therefore, that persons who have paid no particular attention to the study of insects, often confound together insects which, in the eyes of the professed entomologist, look as different from each other as a horse does from a cow or a hog. It would, indeed, be little short of miraculous if this were not so; for there are about thirty thousand distinct species of insects to be found within the limits of the United States, and of course in such a vast multiplicity, there must be many strong resemblances.

"I will therefore conclude this article on the Chinch Bug, by briefly mentioning several true Bugs, belonging to the same sub-order of Half-wing Bugs (*Heteroptera*), as that pestilent little foe of the farmer, and which I know to be frequently mistaken for it. The reader will then, by comparing the different figures, see at once how widely they all differ, and by a very little practice, his eyes will become so well educated that he will soon, without any artificial assistance from glasses, be able to distinguish the creatures one from the other, as they crawl or fly about in the almost microscopic dimensions assigned to them by their Great Creator.

"One reason, perhaps, why so many different bugs are popularly confounded with the Chich Bug, is the similarity of their smell. Everybody is aware that chinch bugs possess the same peculiarly unsavory odor as the common Bed Bug; and hence when a person finds a small insect that has this obnoxious smell, he is very apt to jump to the conclusion that it must be a chinch bug. No mode of reasoning, however, can be more unsafe or unsound. There are hundreds of different species of Half-wing Bugs—the common brown Squash Bug (*Coreus tristis*) for example—that possess this peculiar smell."

THE FALSE CHINCH BUG.—This insect is most often mistaken for the genuine article, and letters like the following, received from a correspondent last Fall, are not uncommon, and relate to it:

[Fig. 9.]



FALSE CHINCH BUG:—*b*, pupa; *c*, mature bug.

> I came across a (to me) curious thing the other day. I have allowed the purslane to grow in my strawberry ground this Summer, thinking to protect the plants from the sun somewhat. Lately we have been clearing it out, and I was much surprised to find under the rank growth millions of chinch bugs. They were not all in the perfect state (winged), but many not half grown. Can they be the real thing? They look like it, and certainly *smell* like it. But the wing-marks do not seem as distinct or broad, only five white lines crossing at an acute angle. Also, the young ones are not red, but ashen gray, and with bodies thicker and broader than the true grain bug. What were they there for? They would not feed on purslane, would they? and no other weeds were there. I found quantities of leaves and fragments of leaves on the ground; but the Chinch Bug is not an eater,

but a sucker, I suppose. If they were there to Winter, it would be advisable to rake it all off and destroy it in some way, but purslane dies hard as well as Chinch Bug. Coal oil, though, will kill him as quick as lightning.

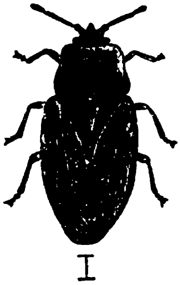
As there is an account, with description, of this False Chinch Bug in my 5th Report, it is only necessary to say in this connection that the species is a very general feeder and in the Spring of the year does much damage to many plants, such as young grape-vines, strawberries, potatoes, young apple grafts, but especially to plants of the Cabbage family. It is especially fond of purslane, and at approach of Winter, congregates beneath it in immense numbers. Long after Jack Frost has blackened and deadened all but the very butts of the plants, these bugs may be found under them, running actively about whenever the sun is the least warm. They are found at this time of all ages, but principally mature and in pairs, and it is doubtful if any but the mature ones survive the Winter.

All the reports—and such come sometimes from noteworthy sources—of chinch bugs injuring herbaceous plants, vegetables and vines, owe their origin to the confounding of this, the bogus, with the true Chinch Bug; for though the latter may occasionally be found sheltering under purslane and other plants, it does not feed on any other than those already indicated.

THE INSIDIOUS FLOWER-BUG—Next to the preceding species, this little fellow, already referred to (p. 41, *ante*) as preying on the Chinch Bug, is quite often mistaken for it, having somewhat similar colors, and being so often associated with it.

THE ASH-GRAY LEAF-BUG—This species (*Piesma cinerea* Say, Fig. 10), is also often mistaken for the great American grain pest. It is a small greenish-gray bug, its size being about the same as that of the Chinch Bug, though it is flatter, broader, with shorter legs, and lacks altogether the conspicuous black and white markings which characterize that little grain pest, and really resembles it in nothing but the unpleasant odor which it emits. It has been found doing some damage to grape blossoms in early Spring, but is not otherwise very injurious, as it lives principally on forest shrubs and trees. The Ash-gray Leaf-bug belongs to an entirely different group (*Tingis* family) from the Chinch Bug, all the species of which have a short 3-jointed beak, which however differs from that of the 3-jointed beak of the Flower-bugs (*Anthocoris*) by being encased in a groove when not in use. They mostly live on green leaves in all their three stages,

[Fig. 10.]

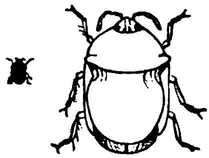


ASH-GRAY LEAF-BUG.

after the fashion of plant-lice. Like the Chinch Bug, the Ash-gray Leaf-bug hibernates in the perfect state, and may be found in the Winter in considerable numbers under the loose bark of standing trees and especially under that of the Shag-bark Hickory. It also frequently swarms in the air, and I have gathered it by hundreds on top of one of the highest buildings in St. Louis, on a warm October day.

The Flea-like Negro-bug—Fourth among the bogus chinch bugs may be mentioned the Flea-like Negro-bug (*Corimelæna pulicaria*, Germar, Fig. 11). Its color is black with a white stripe each side. This insect resembles the Chinch Bug in having an ordinary 4-jointed beak, but differs from it in belonging to a very distinct and well marked group (*Scutellera* family), which is characterized by the enormous size of the "scutel" or shield. This bug has a great passion for the fruit of the Raspberry, and is sometimes so plentiful as to render the berries perfectly unsaleable by the bed-bug aroma which it communicates to them, as well as by sucking out their juices. Wherever it occurs, the nauseous flavor which it imparts to every berry which it touches, will soon make its presence manifest, though the little scamp may elude ocular detection. It is really too bad that such a little black "varmint" should so mar the exceeding pleasure which a lover of this delicious fruit always experiences when in the midst of a raspberry plantation in the fruit season. It is also quite injurious to the Strawberry, puncturing the stem with its little beak, and thus causing either blossom or fruit to wilt. It also attacks both Cherry and Quince, occurring on these trees in very large numbers, and puncturing the blossoms and leaves, but especially the fruit stems, which in consequence shrivel and die. It is also quite injurious to garden flowers and especially to the Coreopsis, and abounds on certain weeds, among which may be mentioned the Red-root or New Jersey Tea-plant (*Ceanothus Americanus*), and Neckweed or Purslane-Speedwell (*Veronica peregrina*). In the month of June under these two last named plants, they may be found in countless numbers of all sizes and ages, from the small light brown wingless, newly hatched individuals, to the full fledged jet black ones. Though found on so many different plants however, it does not, like the true Chinch Bug injure, or in any way effect, our grasses and grains.

[Fig. 11.]



Flea-like Negro-bug.

"To these four bogus Chinch Bugs, might be added one or two other species of small stinking bugs which have been, by some persons, mistaken for the true Chinch Bug. But enough has been already said to show, that insects which in reality are shaped and fashioned as differently as are cows and deer, are yet often confounded together in the popular eye, principally, no doubt, because they have the same peculiar bed-bug aroma. Should the ignorance of the popular judgment in confounding these tiny creatures, which seem to the Entomologist so very, very different from each other, therefore, be despised and ridiculed? Far be it from me to display such intolerant stupidity! As well might the nurseryman ridicule the grain-grower because the grain-grower cannot distinguish a Baldwin Seedling from a High-top Sweeting; or the grain-grower the nurseryman, because the nurseryman cannot tell Mediterranean from Tea wheat, or Club from Fife. I do, however, entertain an abiding hope that by the present very general and praiseworthy movement toward the popularization of natural history, and by the dissemination of Entomological Reports, a better knowledge of this practically important subject will soon exist in the community. Our farmers will then, not so often wage a war of extermination against their best friends, the cannibal and parasitic insects, while they overlook and neglect the very plant-feeders which are doing all the damage, and upon which the others are feeding in the very manner in which a Wise Providence has appointed them to adopt."

RECAPITULATION.

While there is much more on this interesting subject to be said, the length this article has already assumed prompts me to bring it to a close; and I will recapitulate by giving a condensed statement of the more important facts relating to the Chinch Bug:

The Chinch Bug injures by suction, not by biting.—It winters in the perfect winged state, mostly dormant, principally in the old rubbish, such as dead leaves, corn-shucks, corn-stalks, and under weeds and prostrate fence rails and boards that generally surround grain fields; also, in whatever other sheltered situation it can get in adjacent woods: hence the importance of fighting the pest in the Winter time, either by trapping it under boards laid for the purpose, or by burning it with its afore-mentioned shelter. Such burning will not destroy all the dormant hosts, but will practically render the species harmless—especially where whole communities combine to practice it.—It issues from its Winter quarters during the first balmy days of Spring, when those females which were impregnated the previous Fall, and which are most apt to survive the Winter, commence ovipositing at once, if suitable conditions are at hand. Others take readily to wing and scatter over our fields, attracted by preference to grain growing in loose and dry soil, into which they penetrate to consign their eggs.—The eggs are deposited on the roots, and the young bugs, which are red, remain under ground, sucking the roots during the early part of their lives, or until they are forced from necessity to travel from one plant to another. These Spring-hatched bugs, constituting the first brood, do not, as a rule, acquire wings till after wheat is cut. It is, therefore, during and just after wheat harvest, that they congregate and travel in such immense swarms as to attract attention.—In July, as these acquire wings, they scatter over grass, late grain and corn-fields, where they lay their eggs; but the second brood, hatching from these eggs, generally attracts less attention and does less injury than did the first, because of its more scattered nature and the greater maturity and resisting power of the plants.—Anything that will prevent the mother bug from getting at the roots of the grain, will prevent the injury of her progeny: hence the importance in this connection of Fall plowing and using the roller upon land that is loose and friable; and hence, if old corn ground is sufficiently clean, it is a good plan to harrow in a crop of small grain upon it without plowing at all. The earlier, also, that wheat gets well started and matures, the less it will suffer; because it may be harvested before the bugs acquire their greatest growth and power for harm: hence, and from the greater compactness of the ground, Winter wheat suffers less than Spring wheat.—Heavy rains are destructive to the Chinch Bug: hence, if such occur in the Fall, the farmer may plant with little fear of injury the following year, while if they occur in May, he need suffer no anxiety, so far as chinch bugs are concerned: hence, also, where irrigation is practicable, the pest may at all times be overcome.—It injures no other plants than grasses and cereals.—In its migrations from field to field it may be checked by a line of tar poured on the ground, or by deep furrows or trenches, but the tar must be kept soft and the surface of the furrows friable and pulverized.

APPENDIX

TO THE

ARTICLE ON THE CHINCH BUG.

To publish entire all the answers to the questions in the circular sent out over the State would be an unnecessary waste of space; and I have, in this Appendix, endeavored to condense as much as possible without omitting any statistical facts or experience in any way valuable. In order to save space and avoid repetition, I give the returns by counties, signed by the initials of the correspondents, and preface by a list of the gentlemen who have favored me with replies and to whom I hereby tender my sincere acknowledgments. From the counties following which there are no names, reports have failed to come to hand; while a number of replies are unrecorded, because they came to hand without the postoffice address or the county being indicated. In some counties, as St. Louis, I have been able to make personal observations.

LIST OF CORRESPONDENTS WHO MADE RETURNS.

ADAIR—E. M. C. Morebeck, * *; John S. Erwin, Kirksville. ANDREW—J. H. Smith, Whiteville; Jacob Kimbertin, Rochester; R. H. Talbot, Bolckow; John White, Flag Spring. ATCHISON—B. Bond, * *. AUDRAIN— — — BARRY—S. M. White, Washburn; W. F. Tuttle, Hazle Barrens. BARTON—A. A. Dye, M. D., Lamar; J. J. Bryning, Doylesport; W. H. Avery, Lamar. BATES—W. R. Thomas, Lone Oak; G. B. Hickman, Mulberry; Addie Haynes, Rockville. BENTON—J. A. Hughes, * *; James H. Lay, Warsaw; W. F. Joplin, Lincoln; J. H. Maxwell, Mt. View; J. M. Murress, Windsor. BOLLINGER— — — BOONE—J. B. Douglass, Columbia. BUCHANAN—M. W. Farris, Agency; J. P. Reichard, St. Joseph. BUTLER—Albert Ponder, Freddie; John M. Allen, Cane Creek. CALDWELL—C. L. Gould, Hamilton; D. W. Monroe, Kidder. CALLAWAY— — — CAMDEN— — — CAPE GIRARDEAU—Henry Bruihl, Appleton; H. G. Wilson, Cape Girardeau; R. H. Burford, Burfordsville. CARROLL—H. S. Hall, Van Horn. CARTER— — — CASS—W. H. Barron, Raymore; H. L. Hewitt, Austin; P. C. Homey, * *; D. Defahaugh, Harrisonville; W. A. Smith, East Lynn; J. L. Kanaga, Raymore. CEDAR—E. W. Montgomery, Cane Hill; C. N. Jordan, Whitehare; W. Smiley, Stockton. CHARITON—R. Fox, Westville. CHRISTIAN—R. P. Lawing, Ozark. CLARK—B. P. Haman, Clark City; D. H. Lapsley, Kahoka. CLAY—G. T. Odor, * *; Dan. Carpenter, Barry; J. C. Evans, Harlem. CLINTON—A. J. McCrayner, Plattsburg. COLE—Frank M. Dixon, Jefferson City. COOPER—W. R. Baker, Lone Elm. CRAWFORD—James Asher, Clinton Mills; M. O. Taylor, Bourbon, DADE—Ross A. Workman, Greenfield. DALLAS—G. A. Howerton, * *; M. L. Reynolds, Buffalo. DAVIESS—Israel Coen, Jamesport; G. D. McDonald, * *; W. W. Woodbridge, Jamesport; L. Dowell, Bancroft. DEKALB—Horatio Morris, Winslow; G. E. Shulz, Havana; W. T. Wallingford, DeKalb. DENT— — — DOUGLAS—W. Pryon, Pryon's Store. DUNKLIN—W. G. Bragg, Kennett. FRANKLIN—F. W. Pehle, New Haven; S. Miller, * *. GASCONADE—Henry Read, * *. GENTRY—A. J. Clark, Gentryville; Levi

Long, Mt. Pleasant; Charles S. Whitescarver, Mt. Pleasant; Hugh Stevenson, Gentryville; W. H. Rogers, Alanthus; H. W. Johnson, New Castle; J. A. Mauring, Havana; Elisha Brace, Sampson Creek; James Shillingham, * *. Greene—S. A. Edmonsom, Walnut Grove. Grundy—Val. Briegel, Trenton; G. H. Hubbel, * *. Harrison—J. Whiteley, New Castle; Col. H. Fitch, Eagleville; J. H. Burrows, Cainsville; Sam. McCray, Mitchellsville; C. F. Fransham, Yankee Ridge; Wm. Rakestraw, Bethany. Henry—D. C. McIntire, Norris Fork; J. E. Stringer, Leesville; T. J. Quick, Gaines. Hickory—W. L. Snidow, Elkton; James W. Dickerson, * *; C. J. Hostetler, Wheatland. Holt—Bennet King, * *; J. W. Crow, Bigelow; W. Kaucher, Oregon; J D. White, Forest City; J. W. Maple, Oregon. Howard—Garnett W. Morehead, Glasgow. Howell— — — Iron—W. Cam, Belleview. Jackson—Dr. John L. Gregg, Stony Point; W. S. Parrish, Hickman's Mill; J. W. Geiger, Hickman's Mill; J. A. Moore, Pink Hill; W. J. Gault, New Santa Fee. Jasper—J. M. Peterson, Preston; W. G. L. Craig, Smithfield; J. U. Thornburg, Reeds; Thomas McWallie, Avilla. Johnson—W. Campbell, Holden; J. L. Cleland, Chalybeate; Dr. Dunkly, Dunksburg; D. B. Reavis, Kingsville; E. J. Coleman, * *; J. Milo Martin, Pittsville; J. L. Motsinger, Fayetteville. Knox—Jac. Wingerter, Millport. Laclede—L. R. Rupart, Hazle Green. Lafayette—James Belt, M. D., Napoleon; J. J. Ferguson, Sniabar; James E. Gladish, Aullsville. Lawrence—W. L. Goodman, Mt. Vernon. Lewis—W. B. Dement, Bunker Hill. Lincoln— — — Linn—A. Moyer, Brookfield. Livingston— — — Macon—W. B. Martin, College Mound. Madison—Joseph M. Anthony, Fredericktown. Maries—D. L. Dodds, Vienna. Marion—J. K. Martin, Philadelphia; W. R. Anderson, Palmyra; Rufus M. Brown, Palmyra; S. F. Taft, Hannibal. McDonald—W. D. Palson, Southwest City. Mercer—J. H. Burrows, Cainsville. Miller— — — Mississippi—S. S. Smith, Bertrand. Moniteau— — — Monroe—J. P. Myers, * *. Montgomery—D. T. Mitchell, Jonesburg; E R. Brown, Montgomery. Morgan— — — New Madrid—James S. Barney, New Madrid. Newton—John Thrasher, Neosho; W. H. Wetherell, Seneca. Nodaway—W. B. M. Harman, Pickering; W. Pittman, Marysville; W. H. Clark, Luteston; T. D. Wallace, Hopkins. Oregon—J. R. Woodside, Thomasville. Osage—Lucien Philbert, Dauphine. Ozark—James Price, * *; T. J. Gideon, * *. Pemiscot— — — Perry—R. M. Brewer, Perryville. Pettis—Elihu Canaday, Ionia; L. H. Williams, M. D., Houstonia; O. A. Crandall, Sedalia; C. R. Hoag, Sedalia. Platte—James Adkins, Platte City; R. P. C. Wilson, Platte City. Polk—T. W. Simpson, Payne's Prairie; M. D. Mitchell, Morrisville; John Carson, Bolivar; H. M. Wallard, Humansville. Pulaski—Charles Curtis, Dundas; O. J. Ryther, Iron Summit. Putnam—A. D. Thomas, Terre Haute. Ralls—A. E. Trabue, Hannibal. Randolph—W Quayle, Moberly. Ray—* *, Morton. Reynolds— — — Ripley—B. Hassell, Doniphan. St. Charles—C. Weinrich, New Melle. St. Clair—S. H. Long, Taborville; W. H. Fillery, Collins; C. A. Schooley, Taborville. St. Francois—E. H. Perkins, Farmington; F. E. Clay, * *; A. J. Leathers, Farmington. Ste. Genevieve—J. R. Prichard, Bloomsdale. St. Louis— — — Saline—Jno. P. McManus, Lutesville. Schuyler— — — Scotland—Albert North, Memphis. Scott—H. P. Lynch, M. D., Commerce. Shannon— — — Shelby—John B. Randal, High Prairie Home. Stoddard— — — Stone— — — Sullivan—Sumner Boynton, Milan. Taney—J. J. Brown, Forsyth; W. R. Howard, Forsyth. Texas—R. S. Smiley, Houston; George A. Bezoni, Roubedoux. Vernon—M. L. Modrel, Little Osage; J. A. Princeton, Schell City. Warren—D. P. Dyer, Warrenton. Washington—W. Riehl, Potosi. Wayne— — — Webster— — — Wright—E. B. Griffin, Hartville. Worth— — —

QUESTIONS ANSWERED BY CORRESPONDENTS.

1. How far back in the history of your county has this insect been known to injure the grain and grass crops?

2. What crops have suffered most from its ravages?

3. Have any systematic efforts ever been made to overcome its injuries? and have you any idea to what extent my Second Report—which contained all that was known about the insect up to that time, and which was bound in with the Fifth (1869) State Agricultural Report—is distributed or known of among the farmers of your county?

4. Give approximately this year's estimated damage in your county, by this single insect—all crops affected by it considered.

The answers, here following, are numbered to correspond with the questions. Those to questions 1 and 2, which have been summed up on pages 22, 23, 26 and 27, and which are very similar, are almost entirely omitted.

Adair County.

3—No systematic efforts have been made to overcome them. I know nothing of your Second Report; have never seen one.—E. M. C. M. The only attempt to check them has been by plowing a furrow and dragging a log in it. They have sometimes been prevented from passing from grain into corn by this means. I believe very few here have seen the report to which you refer.—J. S. E.

4—I cannot arrive at anything like a correct report for this year. In some locations whole fields of corn, especially late planting, oats and Spring wheat. The last named grain we hold to be the nursery of the Chinch Bug.—E. M. C. M. I believe that 20,000 dollars is a moderate estimate of the damage to crops in this county for the present year.—J. S. E.

Andrew County.

3—None have been made.—J. H. S. No preventives found against them.—J. K. None. Your reports do not get into the hands of many farmers.—R. H. T. None. I have no knowledge of your report on that insect.—J. W.

4—The corn crop has been damaged this year at least one-half.—J. H. S. I should estimate that the damage done this year by these bugs would amount to fully ($40,000) forty thousand dollars.—R. H. T. About 33 per cent.—T. W.

Atchison County.

2—The crop of this year principally injured by Chinch Bug is the corn crop, as they made their appearance too late for small grain.—B. B.

3—No systematic effort has been made to overcome its injuries; but very few copies of your Second Report were distributed among the farmers of this county.—B. B.

4—The damage to the corn crop is fully one-third to one-half, and they are still, to this date (December 24), alive in all protected places.—B. B.

Barry County.

1—The Chinch Bug has never been known in the county or in this section of country prior to the Summer of 1874.—S. M. W. It never was known in this county until this Summer.—W. F. T.

3—No systematic effort has ever been made to overcome its ravages and injuries. I do not know, neither can I learn, of your Second Report being distributed among the farmers.—S. M. W. Nothing has been done to overcome its injuries. I know nothing about your Second Report, but would like to see it.—W. F. T.

4—The wheat was not hurt to any great extent, as it was ready to harvest before they made their appearance in any very great quantities. Corn—late corn—in some localities was ruined. Hereabouts corn was not seriously injured as it was large and forward at the time of wheat harvest. Probably 10 per cent. would cover the whole amount of damage done to all crops. * * * —S. M. W. The damage done in this county was fully one-half of the crops of corn and sorghum, and the entire crop of Hungarian grass and millet, which would amount to many thousands of dollars.—W. F. T.

Barton County.

3—Yes. Some have sown Hungarian grass between wheat and corn, for it seems to be in the wheat-fields that the first crop is hatched. Some neighborhoods have not sown any wheat at all. After the first crop has hatched in the wheat, they plow around the field or keep continually running a roller around it so as to crush them. This seems to keep them back for a week or two. When they get large enough to fly, they leave the wheat-fields and scatter in all directions, where they lay their eggs and hatch out the second crop. * * * —A. A. D. No. Said Report has been seen and known comparatively little.—J. J. B. No efforts have been made to overcome its injuries. I do not think your Second Report is at all known or distributed among the people of this county. To-day, I inquired at every place in town where I might expect to find it, but could not. Nor could those most likely to know tell me anything of it.—W. H. A.

4—On account of our extreme drouth here the last season the Chinch Bug did more than its usual amount of damage—probably $100,000 worth.—A. A. D. Any estimate of said damage would be hard to make, approximating the truth, without a vast deal of trouble, as our wheat was affected some, but chiefly because of the drouth, and oats almost a failure from the same cause. True, both suffered some from the bug, and as to the corn crop in our county, perhaps not one-sixth of an average crop was harvested; one-half of which might be owing to the prevalence of the bug—that is to say, without either bug or drouth, and *with* either alone three times as much could have been raised. Our wheat crop was better than an average since '68.—J. J. B. Cannot estimate the damage from this source this year, as it is impossible to say how much is attributable to the drouth and how much to the bug. Some farmers think they would have had much better corn if it had not been for the bug, but as they raised almost *none*, it is a doubtful question.—W. H. A.

Bates County.

1—The corn crop has suffered most the past season from their ravages. * * * The first crop was not two-thirds grown at the time of wheat harvest. They commenced to fly July 20th and settled all through the corn-fields, but the greatest injury was done by the second crop in the latter part of August and first of September. We think the third crop of them was hatched the first of October, but are inclined to think not many of them came to maturity as we find them dead on the corn-stalks now not more than half grown. * * *—W. R. T.

2—This year for the first time farmers showed some fight. * * *—W. R. T. No efforts have been made to overcome its injuries that have availed any thing; plowing them under and dragging logs, etc., is all that has so far been done. Your reports, on inquiry for them, I find have never been distributed at all among the farmers, and, in fact, I cannot find a copy in the county.—G. B. H. The heat was so intense for several days during the middle of August, that by pulverizing the ground to fine dust and then shaking them from the corn into it, they would roast in half a minute. We are convinced that not more than half a dozen farmers in this county ever received a copy of the Agricultural Report for 1869; in all probability it was more freely distributed among lawyers, merchants and doctors, than farmers. We applied for a copy but never received one.—A. H.

4—There was more wheat sowed this year than ever before in my circle of acquaintance, and while some raised a little wheat many never raised a bushel; if the county raised the seed it is all it has done. Oats were nearly destroyed. * * * The corn crop will not average more than five or six bushels per acre, and as I am not posted with regard to the number of acres in cultivation in Bates county, I am unable to make anything of a correct estimate, but the damage would be fearful.—W. R. T. The damage by this insect in our county this year is impossible to state as we have almost a total failure, and the whole of it is due to Chinch Bug; nothing escaped it in the shape of grain or grass. * * *—G. B. H. We estimate the damage done by this insect alone in this county at not far from one million dollars.—A. H.

Benton County.

3—No efforts made. Your Second Report is not known here.—J. A. H. No systematic efforts have been made against them. A little desultory plowing of furrows is all that has been done. I have never heard of a copy of your Second Report in the county. I desire a copy.—J. H. L. There are no systematic efforts being made to overcome its injuries. I do not think your Second Report is very generally known or distributed among the farmers of Benton county.—W. F. J. No systematic efforts have been made. Don't know anything about your Second Report.—J. H. M.

4—The corn crop was probably damaged 45 per cent. by the bugs and 45 per cent. by the drouth, leaving us about 10 per cent. of a good crop. Our wheat being mostly in the timber was not badly damaged. Inferior wheat crops on the prairie were completely destroyed. Good ones escaped with little damage. * * *—J. H. L. It would be an impossibility to give any correct estimate of damage by its ravages, as the Chinch Bug and dry weather together have caused almost an entire failure in this county.—W. F. J. The damage done by this single insect in our county the past season is so great that I cannot give an estimate.—J. H. M.

Boone County.

4—I cannot approximate the estimated damage in my county.—J. B. D.

Buchanan County.

3—None that I know of. I have no idea that more than one-tenth of the people in this county ever heard of the Report.—M. W. F.

4—The estimated damage would reach several thousand dollars. Have no way of making a correct estimate with me at the present time.—M. W. F..

Butler County.

3—There has been no effort made for their destruction. I have no idea how far your Report has been distributed.—A. P. None.—J. M. A. One-half the crops are destroyed this year.—J. M. A.

Caldwell County.

2—Corn was injured worst, wheat next, oats least; Spring wheat ruined. I believe that the chinches killed new seeding of grass, especially when sowed on wheat or oats ground.—C. L. G.

3—None. Have never seen it, and cannot tell to what extent it has been distributed.—D. W. M. There are in this county 432 sections of land. I estimate one-eighth of the land in the county was planted in wheat and corn, which at $2.00 damage per acre, would give about $70,000. Add to this amount nearly as much more damage, caused by farmers being obliged to sell their hogs and cattle without fattening, (and I am satisfied this is the actual fact): I therefore estimate the whole damage done by chinch bugs in Caldwell county at $125,000. I remember that one year in Wisconsin they were so numerous that in their migration they fell into Lake Michigan, and washed ashore in such quantities as to make a stench along the beach. If this shall be of any use to you in your good work, I shall be amply rewarded.—C. L. G.

Cape Girardeau County.

3—No remedies have been tried that seem to be effective.—R. H. B. No, I think not. Some farmers are talking about burning off the stubble-fields and burning the woods lands, but they do not agree very well about it. I had a field of heavy wheat stubble burned by accident the past Summer, in which there were a few bugs. I shall notice the result next year. I have practiced Fall plowing since I have been farming, and I rather think that it keeps the bugs in check. I have in mind one field that was in corn three years ago, when the bugs first appeared; it had been plowed the Fall before. My neighbors' fields were troubled with bugs that year but this field was not. It was again plowed in the Fall and put in oats in March following, and if there were any bugs in the oats I did not discover them. The oats were taken off in July, the ground immediately plowed and sowed to Hungarian grass. The grass was taken off the 1st of September, the ground immediately plowed, and first of October replowed and sowed to wheat. A good crop of wheat wast taken off last June, the ground plowed in July and again first of September and sowed to grass for meadow. It is now green all over the field, and if that field has ever had any chinch bugs in it I have failed to find them. On the opposite side of a lane lies another field having about the same fertility (rich bottom) and separated by a public road and fences. The latter field was sowed to barley in September, 1873—harvested in June last year. The crop was light—only 25 bushels per acre, when it should have produced 40. I did not know even at harvest, that the chinch bugs were the cause of the short crop. This barley stubble was plowed as quick as the grain could be taken off, and on the first of July the ground was nicely planted with sprouted corn. The corn came up quickly—the ground being rich it grew fast and had a dark green color—but when about eight or ten inches high, I noticed that the bugs were thick on it. It seemed to withstand the effects of the bugs until four feet high, when it was then attacked by a kind of cut-worm of a green color, and the chinch bugs and the worms together completely ruined it. I would like to know more about this worm. (Probably the Fall Army-worm; see 3d Rep.) I hope you will excuse this digression. I have stated facts—they may be of some use.—T. O. Your Second Report has not been distributed in this section of the county.—R. H. B. No efforts that I am aware of, systematic or otherwise, have been made to overcome its ravages, except that it has perhaps induced somewhat earlier planting. Your Second Report alluded to, has not been distributed or known among the farmers of this county, except perhaps a few that may have been distributed by the members of the Legislature.—W. C. R. All crops considered, I should think it would be from $30,000 to $40,000.—H. G. W.

Carroll County

3—No systematic efforts have been made to destroy it. Your Second Report referred to, is not very generally distributed among the farmers, and very little is known of it. Like many other similar documents, it helps to fill up the lank libraries of landless lawyers and impecunious country editors. A State Senator has promised me a set of State Agricultural Reports for the library of Van Horn Grange, (now numbering 125 volumes) but I presume the promise will be forgotten.—H. S. H.

4—I have no data from which to estimate the money damage, but the wheat was badly shrunken, and three-fourths of the corn crop entirely destroyed this year by the chinch bugs. Dry, hot weather is favorable to its development. In wet seasons it does very little damage, * * *.—H. S. H.

Cass County.

3—(All the correspondents agree in stating that no systematic efforts have been made; and that little or nothing is known of my Second Report.)

4—Five hundred thousand dollars would be a low estimate of the amount of damage done by this pest in Cass county this year.—W. H. B. It is impossible to even approximate an estimate of damages. They injured Spring wheat and barley to such an extent that there has been no attempt for several years to raise either. Winter wheat was not injured as much in 1874 as in some previous years. Oats crop reduced at least 40 per cent. Corn (the principal crop cultivated) was injured to such an extent by drouth and bugs that the south half of the county will not average over ten bushels per acre, and that of *very* poor quality—principally chargeable to the bugs, from the fact that occasional fields more favorably situated, (by being partly or altogether surrounded by timber, at greater distances from fields of small grain, etc.,) made a fair average yield regardless of drouth. * * * —H. L. H. Can't make an estimate of the amount of damage done in the county this season. It was immense. They reduced the wheat and corn crop from one-fourth of an average yield to an *entire* failure.—P. C. H. The damage sustained by them in Cass county this year was fully 50 per cent.—D. D. The amount of damage in this county is enormous. Corn nearly ruined, wheat and oats badly damaged.—W. A. S.

Cedar County.

3—(All the correspondents state that plowing and ditching and dragging were alone resorted to; and that nothing is known of my Second Report.) I can't say just how much we were damaged by the Chinch Bug; they ate about two-thirds of our crops clean. The farmers in this county are going to have a hard time to get through the winter.—E. W. M. They destroyed about one-third of the wheat crop, three-fifths of the corn crop, one-half the oats and Hungarian, and one-half the sorghum.—W. S.

Chariton County.

3—There never has been any effort made to destroy it, but I think it is high time that we make an effort in that direction. I do not think there is a farmer in my neighborhood that ever saw your Second Report or ever knew anything about it.—R. F.

4—It is impossible for me to give anything like a correct estimate of the damages done by this insect during the past season, because we had a protracted drouth which commenced with the bugs and lasted through the entire growing season. Spring wheat was totally destroyed, and none but the early Fall wheat escaped its ravages, and I think there is scarcely a stalk of corn in all the western, northern and northeastern portions of this county that has not suffered more or less from this pest; and owing to the drouth and Chinch Bug combined, there was not five bushels of corn raised to the acre, taking the county over.—R. F.

Christian County.

4—The bugs cut off our corn on an average about six to seven bushels to the acre. —R. P. L.

Clark County.

3—No systematic efforts to prevent their ravages. I think your reports are not much known in Clark county.—B. P. H. No efforts have been made to overcome their injuries. You have my thanks for your Sixth Annual Report. I have failed to get hold of your former reports.—D. H. L.

4—Probably $20,000 or more. Many crops of Spring wheat and barley were entirely destroyed, and corn near such fields was badly injured by the bugs after leaving the small grain. They seemed also to breed in the corn in August and September, and caused a great deal of corn to shrivel while in roasting ear.—B. P. H.

Clay County.

3—No; neither systematic or spasmodic. I do not think your Report of 1869 is in the hands of one farmer in fifty, and I doubt if one in a hundred has ever seen it.—D. C. We do not think your Second Report was known of in our county, except in our immediate neighborhood, where it was distributed by our Missouri Valley Horticultural Society—J. C. E.

4—Corn was cut off one-third, oats nearly as much; wheat was damaged but little, it was too early for them.—G. T. O. Cannot give even a guess at the damage. I know some oat-fields yielding nothing, some wheat not over one-half crop, corn-fields the same, and thus graduating up to no injury at all—D. C.

Clinton County.

3—None. However, a few farmers burned their wheat-fields instead of trying to harvest them.—A. J. M'C.

Cole County.

3—No systematic effort has been made, as far as I can say, to checkmate the ravages of this pest. To what extent your Second Report has been distributed, I would say, to the best of my belief, not very extensively; nor do I believe such reports ever will reach the class of men they are intended for unless other ways are devised to distribute them more widely and with more certainty.—F. M. D.

Cooper County.

3—No systematic efforts have been made. * * * Your Second Report I do not think is distributed to any extent among the farmers of this county. I think the wheat and corn crop injured to at least one-fourth their value.—W. R. B.

Crawford County.

3—There has been no effort, only to sow early; this has saved the wheat crop this year. I have not seen one of your reports in the county.—H. A. There has been no systematic effort made to overcome its injuries to my knowledge.—M. O. T.

4—Wheat, none; oats, one-half; corn and grass the same.—J. A. I have endeavored by conversation with farmers and others in different parts of the county to obtain something near the amount of damage done by the Chinch Bug this year, but am unable to arrive at anything definite; suffice it to say it is thousands of dollars. * * * —M. O. T.

Dade County.

3—No. Individual efforts, such as plowing out a trench and dragging a log in it, or burning trash in it. Keeping a strip ot fallow land between infested crops and those not infested, also planting objectionable crops, such as castor beans, between wheat and corn, has been tried, but with no very encouraging success. Your Second Annual Report is unknown to the farmers of this neighborhood. I have sought for it in vain.—As to my own experience, I find that enough chinch bugs do not winter over on my place (two miles from timber) to seed it in the Spring. But every Spring, soon after the earliest corn is up, they come in on the wing before the wind, and take possession of, and lay their eggs on, every green thing that suits their purpose. At the same time that the eggs hatched out in the wheat, they also hatched out in the early planted corn, while there were none in the corn and Hungarian planted and sown after the Spring invasion, until they were driven out of the wheat and oats by the harvesters. In these Spring migrations they always come from the same direction—southwest before a southwest wind, and apparently from a strip of timber on Horse creek, about three miles away. According to this, trenching, etc., will do very well for late crops, but is of no use for those crops that are up before the Spring migration, which occurred last Spring, as nearly as I can recollect, the first week in May, and all over the county at the same time. I believe that if we can get a good game law, absolutely prohibiting the trapping and netting of quails and prairie chickens, and then make the farmers see that it is to their interest to have it enforced, we will be injured no more by the Chinch Bug.—R. A. W.

Dallas County.

3—One of the most successful means employed is the following: As soon as you cut a piece of wheat or oats you will find they begin to migrate the same day to the adjoining crop, then you have your base of operation. Either haul straw, litter or something that will afford them shade, and about 2 or 3 o'clock P. M. you can, by burning the straw, burn millions of them. * * *—M. L. R.

4—Enormously; past my calculation. Have never seen a copy of your Second Report. Such documents are generally sent to lawyers, politicians, officers and professional men, who never read, much less make practical use of the valuable knowledge contained in them. I have often seen piles of such valuable books lay in our postoffice for months addressed to such persons. * * *—G. A. H. I am sure I will not make an overestimate of damage by the bug in placing it at $50,000.—M. L. R.

Daviess County.

3—During the last Summer, 1874, as soon as the wheat straw became dry the chinch bugs marched out of the wheat and into the corn; they went and blackened every stalk of corn for fifteen rows deep and next to the wheat. When I discovered this I took a large kettle and placed it near the Chinch Bug operations, filled it with water and went to work on them like some of our good house wives wage war on another insect that carries the same kind of odor. I thus cooked them by the millions. This ended their work of destruction in the field; the scalding did not destroy the corn, as it continued growing and produced good sound ears of corn.—J. C. None. I do not think there are ten farmers in the county that have ever seen your Report of 1869, or any other year. I have never had one in my possession until the last one you sent me. Through the kindness of our then Circuit Clerk, I had the privilege of reading your Report for 1869 in his office. I never had one to read and study as I would like to have done and to refer to when I needed information from it. I was once in the clerk's office where I saw a number of volumes of the Report. I asked the deputy Clerk if they were intended for distribution? He replied that the names of the persons whom they were intended for were written on them by our Representative. I looked over them and found but one farmer's name, and he a former Representative and more politician than farmer. * * * —G. D. M'D. There have been no systematic efforts made to overcome its injuries. Right here comes a difficulty: the majority of farmers are more disposed to growl at their enemies than to grapple with them; it being much easier to wait than to work. I often wonder that such men as yourself and others, who are doing so much to enlighten and benefit the farmers, do not become discouraged and disheartened. Permit me to remark, however, that the better class of farmers do appreciate their efforts. The State Agricultural Report for 1869, or any other year, has not been distributed in this county; if there are any copies of such reports in the county they must be in the hands of some judge or lawyer. I should be very glad to know how to obtain such reports.—W. W. W. No systematic efforts have ever been tried to overcome its injuries, and your Second Report is but little known or distributed here. A few copies of your Annual Report distributed in this county would do much good.—L. D.

4—Owing to the drouth and the chinch bugs we have not one-tenth part of an average crop of corn. It was the only crop seriously injured by them, though I heard of some fields of wheat and oats entirely destroyed by them.—G. D. M'D. Spring wheat and sorghum totally destroyed; corn, from one-third to one-half; oats, one-quarter; Winter wheat, one-sixth.—W. W. W. The exact amount of damage done by this insect can not be determined, but it will probably exceed $400,000 this year.—L. D.

DeKalb County.

3—Your reports are not known in this county.—H. M. None. Your Report spoken of has not been distributed in this section among reading and thinking men. I have heard of a few copies in the hands of a few political favorites of that day.—G. E. S. No efforts have been made to counteract their ravages, and your Second Report is not in the hands of but few, very few, of the farmers of this county.—W. T. W.

4—Destroyed three-fourths of our corn crop.—H. M. Damage to all crops about 85 per cent. this year.—G. E. S. The damage has *not been nearly* so great in the timbered lands as compared with prairie lands.—W. T. W.

Douglas County.

3—No efforts have been made. I have no idea to what extent your Second Report was distributed among the farmers.—W. P.

4—I estimate the damage from this pest, all crops considered, at 35 per cent.—W. P.

Franklin County.

3—None.—T. W. P. I am not aware that any systematic efforts have been made to overcome its injuries, except in sowing such varieties of wheat as ripen early. It has been found that early maturing wheat is almost or entirely free from its ravages. I do not think that your Second Report has been distributed among the farmers of this locality.—S. M.

4—Chinch bugs have damaged this county from 80 to 100,000 dollars for the year 1874.—F. W. P. I believe 10 per cent. would be inside the damage done to all crops in this county by the Chinch Bug this season.—S. M.

Gasconade County.

3—No systematic efforts have been made for their destruction. Your Report is almost unknown in our midst; I managed to get one copy.

4—The estimated loss on corn and wheat occasioned by these bugs during the year 1874 will probably reach $55,000 or $60,000. The loss on sugar cane is not known, say $3,000 or more, as they are particularly fond of it; sometimes destroy the whole crops.—H. R.

Gentry County.

3—There has been no settled plan among the farmers to check the ravages of the bug. Your Second Report has never been circulated in this county.—A. J. C. None. Nothing known of your Second Report.—L. L. No effort made to overcome its injuries. Don't know of a copy of the Agricultural Report for 1869 in the hands of a farmer.—H. S. No systematic efforts have been made. Have never heard of your Report.—W. H. R. No. —. It is not in this part of the county.—H. W. J. No systematic efforts were made. Your report is little known.—J. A. M. No. Never saw it.—E. B.

4—I could not pretend to approximate the losses. They were terrible.—A. J. C. The damage this year has been very great; at the least value fully one-half of the corn and nearly all the Spring wheat and a great portion of the Fall wheat was ruined.—L. L. They have destroyed at least nine-tenths of the Spring wheat, one-sixth of the Fall wheat and one-sixth of the corn; oats, one-tenth.—W. H. R. This year's crops were injured 30 per cent.—J. A. M. Cannot do it, but will inform you that all Spring wheat was destroyed, and also one-quarter of corn.—E. B. The past Summer they destroyed nearly all the Spring wheat, many fields having never been cut, while many fields that were cut did not pay for the cutting. Hungarian grass suffered in about the same ratio as Spring wheat. Corn was badly damaged in places, slightly in others.—J. S.

Greene County.

3—None, except to plow ditches between the wheat and corn and drag a log in them. Don't know of a farmer that has one of your Reports.—S. A. E.

4—Corn five-tenths lost; wheat but little damaged; oats and hay one-half lost.—S. A. E.

Grundy County.

3—No systematic efforts have been made, and your Report is but little known. It is the general practice here to put out large corn crops, cherish great expectations, and see them devoured by these hungry pests. Spring barley is doomed to certain destruction, and no inconsiderable amount of wheat is thus annually lost. I have, indeed, sometimes heard farmers advocate clearing fence corners and burning corn-stalks to give them nothing to Winter under, but always concluding that as long as the rest don't fall in it is perfectly useless to trouble themselves about it.—V. B. No. Your Report is little known; say 10 copies in county.—G. H. H.

4—The average damage sustained by the corn crop was at least 60 per cent.; of the wheat crop about 25 per cent.—V. B. $50,000 is a moderate estimate. The corn crop was nearly ruined by them.—G. H. H.

Harrison County.

3—No. Not distributed among farmers generally.—C. H. F. No. Very little, I think.—J. H. B. None have been made. Your Report is not known in this neighborhood.—S. M'C. To my knowledge, none have been made. My idea is that if any of your Reports of 1869 were sent to this county, they were distributed amongst the merchants and mechanics, and not among those that would be benefited by getting them.—C. F. F. None have been made, and your Report is not much known among farmers.—W. R.

4—The damage this year to all crops has been 25 per cent.—J. W. Not so bad this year as in some other years.—J. H. B. They commenced later last Summer than usually, and worked later in the Fall. They did not damage Winter wheat very much, but cut the corn crop fully one-half short.—S. MCC. Spring wheat, in many places, entirely destroyed; cane damaged one-fourth, and corn, from chinch bugs and dry weather, not half a crop. Many claim that the bugs did more damage than the dry weather.—C F. F. They took half the corn crop, all the Spring wheat, half the young meadows damaged.—W. R.

Henry County.

3—(All three of the correspondents unite in the statement that no systematic efforts have been made, and that they have seen nothing of my Second Report.)

4—The damage done by Chinch Bug and drouth cannot fall short of one million of dollars.—D. C. M'T. It would be a difficult matter to give an estimate of the damage caused by them here this year, as no one escaped entirely and large fields of grain were destroyed.—J. E. T. They and the dry, hot weather ruined our corn almost entirely, and oats also, so that we have not seed of either, and the most of us think of quitting small grain. * * * If we have another dry season like last year we are ruined, for there are plenty of people here now that have next to nothing to live on or to keep their stock with.—J. J. Q.

Hickory County.

2—Corn crops suffered most from its ravages, although old bugs that lived through last Winter, and there were legions of them that did, commenced their work in destroying the young growing wheat in early Spring, and some fields of wheat were totally destroyed by them before the wheat got in bloom, and by the time the corn was in silk and tassel, it was covered alive with the little devils; and fields of corn that were near or adjoining to wheat-fields, were killed dead by the time it was half leg high. The weather being very hot and dry, they would destroy acres a day. I am of the opinion that there were at least three if not four broods of the devils in the year, the last brood came out in the latter part of September, and it does look to me as if the little fellows had nearly all died off with cold, thirst and hunger, the sap being so completely dried up in the vegetation when they came out they could find nothing to feed on; in the fields one could see them by the millions crawling on the ground hunting something to feed on; one can see millions or legions of dead ones in the dry corn-stalks. I made a close search for live ones the other day; I only found two alive. I am satisfied with the same pains last Winter one could have found thousands of them alive. I give it as my opinion that if they died off everywhere else in Missouri as they have here, they will do but little damage next season.—W. L. S.

3—No effort has been made yet. Last Fall many farmers did not sow any wheat on account of the bugs. About your Second Annual Report, there may be some in the county, but I do not know of a single copy.—C. J. H.

[The other answers are to the same effect.]

4—The damage this year is more than I am able to estimate correctly; it is thousands of dollars.—W. L. S. The damage this year is great, but I cannot give a correct estimate.—J. W. D. To give an estimate of the damage done by chinch bugs would be impossible for me to do. I think about one-fourth the wheat crop was destroyed, and over four-fifths of the corn crop, and one-third of oats and young timothy. * * * My idea is, if we would plant no corn, or all early corn that would ripen before the second crop of bugs would be hatched, there would be no bugs to Winter, and that would run them out. C. J. H.

Holt County.

3—None. Your former reports have not circulated much beyond the officers of our agricultural society. B. K.—No. I have the first man to find yet that ever heard of the Report you speak of. J. W. C.—Where they exist in stubble, it is found that Fall plowing exterminates many of them. This recently has also been found to be effectual in destroying grasshoppers, that is, where they are turned under pretty deep before being hatched. Your Reports are extensively read by farmers in Northwest Missouri. The only fault being that they are not generally distributed; but few copies ever find their way here only through our Representative, and they fall far short of the demand. Many of our newspapers, through downright ignorance of what they are writing about, speak lightly of the results of your department, as they do also of the agricultural department. I think that if your Reports, besides being published in book form, could be distributed in printed slips as fast as prepared, and published in the county papers, at least, a great amount of good might be effected. Nearly every farmer of any intelligence might be reached in that way. The State had better pay for the printing of such information in the newspapers than for the publication of the laws, as very few men read the latter, but depend solely for their interpretation upon the lawyers and others who read them. —W. K.

4—My estimate of their damage in this county for 1874, is as follows, to-wit.:

To 1,000,000 bushels corn, at 50 cents per bushel	$500,000
To 40,000 bushels small grain, at same	20,000
To 2,000 gardens, at $10 each	20,000
Total damages, actual	$540,000

This is a low estimate.—B. K. You cannot get two farmers to agree about what they were damaged. I believe my corn was damaged at least one-half, or thirty bushels to the acre; my wheat but little.—J. W. C.

Howard County.

3—None. Was not much distributed or known.—G. W. M.

4—The corn suffered more than wheat this year; $50,000 approximate damage—G. W. M.

Iron County.

3—No systematic efforts have been made to check them. Few, if any, copies of your Reports have been distributed here—W. C.

4—Damage may be divided as follows: Corn, $100,000 to $125,000, (¾ of the crop); wheat, $30,000 to $45,000; oats, timothy, Hungarian and sorghum, (last destroyed), $20,000 to $30.000. My own experience is that by sowing no Fall wheat, except what can be sown early and well, and rye same, we might in a few years rid ourselves of this pest. I have noticed that in a spot manured lightly with stable muck, Fall wheat *never* suffers. If the ground is strong enough to give a good, healthy straw, carrying plenty of silica or glazing up with it, they *cannot* damage it much, and if stubble and trash was more generally burned, they would not breed in it, or under it, rather. The young broods get out here in the latter half of June, and early wheat is ready for the sickle by the 15th or 20th. Spring wheat seems to encourage and increase them more than anything else. I have not had the time or means to experiment, but think the best way, after the way suggested above, to prevent them, or even better perhaps with it, would be to sow thickly a strip of Spring wheat around the Fall wheat, and then when they had sucked it dry, which they would as soon as the Fall wheat was out, and before they began to move for other fodder, set it on fire after nightfall, if practicable, to prevent their flying from the flames. A strip of sorghum sown or planted in rows would entice and delay them, but would not burn unless straw or other combustible material was strewn in it. P. S.—I was hauling stock fodder for my stock the other day, and observed a great many chinches that were dormant, but quickened when exposed a minute or two to the warm sun, and it occurred to me that after this, whenever I had a cornfield infested with Chinch Bug I would cut and shock it all up, so that when it was hauled out in the Winter, while the bug was dormant and helpless, they would be exposed, trodden in the manure and destroyed. Certain it is that where they swarm as thickly as they have done here for three or four years, we should not adopt or practice one plan of destroying them, but every plan. It seems peculiarly unfortunate that at this juncture, when the productive industry of the whole country is reduced to such straits by having borne the onus of the hot-bed system of protection to manufacturing enterprises, that we should be compelled to contend at such a disadvantage with such an enemy as this, and yet, "looking through nature up to nature's God," I cannot but regard it as a blessing in disguise, for it will *compel* our slow, conservative clod-hoppers to adopt better and more careful methods of cultivation.—W. C.

Jackson County.

3—None that I have heard of. I never heard of your Second Report before. —W. S. P. (The other answers are to the same effect).

4—At least $150,000.—W. S. P. The damage done this year was immense, especially in the western half of the county. Half my corn crop was destroyed.—J. W. G. Impossible to give an estimate. They have almost ruined the farming interest in this county and State.—J. A. M. Two-thirds of crops ruined.—W. J. G. I would guess about $500,000.—DR. J. L. G.

Jasper County.

3—There have been no efforts made to overcome the Chinch Bug, except ditching between wheat and corn. By this means they have been kept off of corn for a time. We plow a deep and narrow ditch; then drag a round log back and forth in it to pulverize the dirt and wallow them in the dust, and if the weather is hot they die by the hundred thousand in these ditches, at noon day, especially if these ditches run north and south; but as soon as a sprinkle of rain comes so as to settle the dust, they cross over. In the meantime, the old ones are flying where they please, depositing their eggs, which soon hatch out. So you see by ditching we only save a few rows of corn from being killed outright. I have no idea of the extent of your Second Report among the farmers of this county.—J. M. P. No efforts have been made to destroy them, except to plow ditches and dragging logs in them. I have never seen your Second Report, nor can I learn of any one that has. * * *—T. M'W. (The other answers are to the same effect).

4—I cannot give approximately the damage done in this county this year by this insect. Suffice it to say, the damage is immense. * * *—J. M. P. In 1874 corn was not over one-fourth of a crop (if that) on account of drouth and bugs.—J. U. T. Wheat being very early in 1874, was not injured much, but oats was, and corn, I might say, was destroyed by them and the dry season. * * *—T. M'W. As to the estimated damage the chinch bugs have done the past year, I am unable to say, but will say our corn was almost an entire failure, a great many not raising a bushel, and none making a full crop; but the drouth was severe, and all other crops were hurt by the bugs.—W. G. L. C.

Johnson County.

3—People have tried a great many remedies but have not succeeded in defeating the bug. Your reports have never been distributed in this county to my knowledge.—W. C. Few efforts have been made to overcome their injuries. Some have tried sowing hemp between the wheat and corn, but of no avail—as soon as they become winged they fly over it. * * * Some years ago I manured one acre of ground in the Fall, (there were two acres in the piece, half being manured,) and sowed it in wheat. The next Summer the bugs worked on the wheat very bad. The acre that had no manure they almost ruined; but the manured acre they did not hurt; it ripened right. The other was very badly straw-fallen, and was very much shriveled. I have heard of others doing the same thing, and having the same success. In some parts of the county they have stopped raising wheat entirely, thinking to starve them out in the early part of the season, so they cannot increase before harvest, and by so doing, we will get rid of them in a few years.—J. L. M.

4—About 50 per cent.—C. J. C. Five hundred thousand dollars won't cover the damage in Johnson county last Summer. The greatest damage was done by what is termed the second crop, depleting the corn before it matures.—J. M. M. I don't think that the damage done in this county this year would fall short of half a million of dollars, from the fact that half the wheat and almost the entire crop of corn was destroyed or badly injured. * * *—W. C. There is not a farmer that will make both ends meet in all this county. Many will be bankrupt, *and all this by one little insect called the Chinch Bug.*—DR. D. Thousands of acres of corn were killed as dead as if burned—not a stalk left. They took three-fourths of the wheat crop, and about the same of the oats In the southern part they took all the wheat and oats, and they took also nine-tenths of the corn. There is a diversity of opinion as to the amount of damage done by them, varying from one and a half to two millions of dollars for all crops.—J. L. M.

Laclede County.

3—No systematic efforts have been made to overcome their injuries. They usually make their first appearance in the wheatfields, but in every instance where the wheat was sown sufficiently early to allow it to mature early, they have not done any serious damage to it, but late sown wheat has pretty generally been destroyed by them. * * * The 2d brood made their appearance promiscuously over the fields, and more especially in meadows that were cut early enough to admit the young grass to start up, when they soon kill it outright, both root and branch. * * * —L. R. R.

4—It would be utterly impossible for me to give approximately anything like a correct estimate of the damage done in the county by the chinch bugs either in the present or any previous year. It is ascertained that they will not depredate upon hemp, flax, castor beans, navy or other kinds of beans.—L. R. R.

Lafayette County.

3—No effort has been made to check it. I know of but one copy of your Report—J. B. No systematic efforts have been made at their extermination. I do not think your Report has been circulated or is much known.—J. E. G.

4—Have no idea of the damage done in this county.—J. B. It is conceded by every one with whom I have conversed on the subject, that the drouth cut off at least one-half from an average crop, and the bug certainly injured the remainder fully one-half. * * * Wheat was of very fine quality, and a good yield, being only slightly injured by the bug; the very late sowing worse than early sowing, in this part of the county. The damage to this county by the bug will not fall short of half a million dollars.—J. J. F. Putting drouth and chinch bugs together, they came near causing an utter failure, there being only about one-fifth of a crop of the grains, and that fifth of inferior quality. —J. E. G.

Lawrence County.

4—Cannot give the exact amount of damage done; corn is about one-half a crop. My opinion and that of many other farmers is that $100,000 will not cover the damage done by the bugs.—W. L. G. (Other correspondents put the loss of sorghum and oats at fifty per cent).

Lewis County.

3—No systematic efforts have been made. I have never seen your Report.

4—I should think that one-tenth would be a fair estimate, corn suffering the greatest; yet we raised a fine crop, superior to any we have had for several years.—W. B. D.

Linn County.

3—There have been no systematic efforts made to overcome the injuries of the bug that I have any knowledge of. As to your Second Report, I have never seen it, and do not think it is known among the farmers of our county.—A. M.

4—I think the damage by the bugs, irrespective of drouth, equal one-half of the whole crop. The wheat crop was not damaged by the drouth, and oats but very slightly, yet I think both damaged by the chinch bugs to the amount of one-third.—A. M.

Macon County.

3—No. Do not know anything about the Report referred to.—W. B. M. About one-fourth—all grains considered—of the crops lost.—W. B. M.

Madison County.

3—We have found out no means to exterminate them. We, however, have burnt stubble and in so doing have destroyed many of them.—J. M. A. It would be safe to say that our crops were cut short fully one-fourth this season by the bugs, except early wheat, which matured before the insect did much damage.—J. M. A.

Maries County.

3—There have been various plans adopted to subdue the insect: one way was to ditch and drag a log in it; another was to scald them; another was to scatter straw under and around the corn and set fire to the straw. This latter plan seemed to prove a success, but only for awhile—a heavy gale from the north blowing innumerable bugs over the cornfield. * * * I have heard nothing of your Second Report.—D. L. D.

4—I am not able to answer your fourth question definitely. Corn yielded about eighty per cent. less than the average, chiefly on account of chinch bugs and drouth; oats about fifty per cent. less; wheat was about twenty-five per cent. better.—D. L. D.

Marion County.

3—Two years ago I had wheat and corn in the same field, and when the wheat was harvested the bugs went into the corn. I let them have about a week to get a start in the corn, then I took a breaking plow and turned about eight rows of corn, bugs and all under, as deep as I could, and then put a heavy roller on it and rolled it thoroughly, and that was the last of those bugs, I think, as the corn was but little injured afterward. I have no idea to what extent your Second Report has been distributed in the county, but in this neighborhood there is nothing known about it.—J. K. M.

4—By consulting a number of the best farmers, we conclude the crops have been injured about one-fourth this year by the bugs.—J. K. M. I should estimate the damage done to the crops in this county alone this year to be at least $50,000.—W. R. A.

McDonald County.

3—There has been nothing of note done to prevent or destroy them. As for your Report I do not know of a single copy in the whole county.—W. D. P.

Mercer County.

3—No systematic effort has been made to overcome the bug or its injuries. Little or nothing is known of your Report of 1869, as but very few copies of the Agricultural Reports reach here.—J. H. B.

4—It would be a very difficult task to approximate the damage done by this *great pest*. In this county it may be put at $100,000 to $500,000.—J. H. B.

Mississippi County.

3—No. I do not know of any person that has received a copy.—S. S. S.

4—Impossible to make a truthful estimate.—S. S. S.

Monroe County.

4—It has damaged oats and corn one-half, wheat three-eighths. Cannot give an estimate in dollars and cents.—J. P. M.

Montgomery County.

3—Fire is being used against them this Winter very much, burning old litter of all kinds. In Summer shallow ditches are made with the plow and logs and other weights dragged along those ditches to keep them from going in standing crops.—D. T. M. There have been no systematic efforts made to overcome its injuries. I do not think your Second Report has been distributed or known among the farmers of Montgomery county to any extent.—E. R. B.

4—From the best information I can get and from actual observation, I would say that the corn crop of the county was injured one-fourth. Wheat was less injured generally than for several years. I could not well approximate the damage in dollars and cents.—E. R. B.

New Madrid County.

3—No systematic efforts have ever been made to overcome its injuries. I do not think your Second Report is extensively circulated among farmers in the county.—J. S. B.

4—It would be impossible to give, even approximately, the damage done to this year's crop. It was comparatively slight.—J. S. B.

Newton County.

3—I think none at all. I have not even seen your Report before, and do not think there are many, if any at all, in the hands of farmers in this county.—J. T. No systematic efforts have ever been made to overcome its injuries. If any of your reports have ever reached this county, I have been unable to find one.—W. H. W.

4—It is very difficult to tell anything about the amount of damage, on account of the great drouth, but it was many thousand dollars.—J. T. They damaged the wheat about one-fourth, and killed nearly all the corn.—W. H. W.

Nodaway County.

3—While I was a member of the Twenty-sixth General Assembly, I secured about 40 copies of your Second Report from various sources and distributed them amongst our leading farmers and fruit-growers. These, I think, are about all that have been received in our county, although it has been eagerly sought for and fully appreciated by our people.—W. B. M. H. None. I think about one farmer in fifty has your report, and perhaps one-fourth have studied the insect's history.—W. P. Odessa Spring wheat is generally considered here as best standing their injuries, but has not been sufficiently tested to speak positively in regard to its merits.—T. D. W.

4—This year it damaged oats fully 3 bushels per acre, and Spring wheat 2 bushels; Fall wheat, rye and barley about 1 bushel per acre. The first crop of tame hay it did not injure, but the aftermath was cut short fully one-fourth ton per acre, and corn about 6 bushels per acre.—W. B. M. H. One hundred thousand dollars.—W. P.

Oregon County.

3—No. I have no definite idea, but believe there were very few copies distributed. —J. R. W.

4—About ten per cent.—J. R. W.

Osage County.

3—No systematic efforts to overcome their injuries have been made to my knowledge. Some have tried to keep them from spreading all over their farms by plowing and ditching, some by sprinkling a few rows of their corn in advance of them with a mixture of coal oil and water. It kept them from crossing for a few days, but did not prevent them from flying over and destroying the balance of the crop. Your Second Report was distributed among a limited number of farmers.—L. P.

4—The estimated damage done this year in this county by the Chinch Bug may be put down thus: wheat, one-fourth of the crop; corn, three-fourths of the crop; hay, one-half; oats, one-third—which would amount to several hundred thousands of bushels of grain, and several hundreds of tons of hay without the loss of meadows, for they have destroyed mine root and branch, besides a good many others.—L. P.

Ozark County.

3—None.—T. J. G.

4—About one-half the crops destroyed.—T. J. G.

Perry County.

1—We have been troubled with them for eleven or twelve years. Some years they do but little damage, and other years, generally dry seasons, they nearly ruin our crops, especially late corn. About five years ago the bugs were very bad and the next year we expected to have our crops entirely destroyed by them, but they had nearly disappeared. Last Summer they were very bad, it being a dry season, and they damaged corn very much; wheat being very early escaped their injuries.—R. M. B.

Pettis County.

3—None. I have never seen your Report; have tried to get it but failed.—L. H. W. No systematic efforts have been made to overcome its injuries. In regard to your Second Report, I have to say that probably not twenty copies have been distributed in this county. I never saw one, nor have I heard it mentioned by a single farmer of the county. Permit me to suggest that all your Entomological reports would be of vast importance to the farmers if placed in their hands, either with or without the Agricultural Reports. I have received two of them, and hoped to be able to secure them all as fast as published, but have been unable to do so—O. A. C.

4—I think $5 per acre as the loss sustained by the corn crop alone would be a low estimate.—L. H. W. The damage done by the Chinch Bug alone is alarming; it cannot be less than $800,000, including damage done to all kinds of crops.—E. C. The damage done by them last year was great, but it is impossible to make anything like a correct estimate, as the drouth did greater damage, and both were upon us at the same time. In the south part of the county the oats and corn crops were entirely destroyed, while in the northern part of the county, where the soil is deeper, not more than one-fourth of a crop was raised.—O. A. C.

Platte County.

4—Not less than $100,000.—J. A.

Polk County.

2—But little damage was done to the wheat crop, but the oats, corn and Hungarian grass was badly damaged all over the county, and a great many fields entirely destroyed. * * * The farmers of this county are beginning to cut off their corn and pull the stalks whenever they can feed them to their stock, thinking in that way to destroy their eggs, which they think are deposited in the husks and blades, and in fact any kind of leaves or trash about the fences seem to be where they deposit their eggs. —J. C. [This is of course a fallacy.]

3—Plowing and dragging logs are the only means reported; and but few copies of the Report have been seen.

4—$500,000. Do not know as these figures are near large enough; would think $800,000 or $900,000 would be nearer the truth.—* * I think I am safe in saying that the entire grain crop of this county was damaged one-half by the bugs.—T. W. S. Wheat crop was not damaged much; corn crop almost a total failure.—M. D. M.

Pulaski County.

3—Nothing has yet been done to any extent to overcome its injuries. Your Second Report has been read by the reading farmers of my county; but a few copies have been sent us.—C. C. There have been no systematic efforts made to overcome its injuries. I have no idea to what extent your Second Report was distributed or known among the farmers in this county, but think there were but few distributed.—O. J. R.

4—Caused a loss to our county in corn, as near as I am able to calculate, of 132,750 bushels at fifty cents per bushel, $66,375. There is no doubt but that the hot winds during the second week in August and the drouth during the Summer had a serious effect upon the corn crop, but nothing to be compared to the injury of the Chinch.—C. C.

Putnam County.

3—No effort has ever been made to stay their ravages. The report of which you speak is probably oftener to be found among the books of professional men at the county seat than among the farmers.—A. D. T.

4—The damage by Chinch Bug this year was not, comparatively, great. It was confined to late sown wheat and late planted corn.—A. D. T.

Ralls County.

8—Nothing is known here of your Report. There are not more than three or four copies of that Agricultural Report in the county of Ralls.—A. E. T.

4—Injured crops 25 per cent. Saw a man who lives in Sny bottom; says prairie grass cut last year is so infested with chinch bugs the stock will not eat it, and some mules that eat it have died. I have seen in the last ten days any quantity of them sticking on the prairie fences and alive. Following your advice, I burnt some weeks ago 200 acres of rubbish on my prairie place, twenty-five miles from here, and hope I scorched some of the rascals. They are worse on prairie than timber land.—A. E. T.

Randolph County.

3—Do not know of any systematic efforts to overcome its injuries. Have never heard your Report mentioned in connection with it; do not know that any of the farmers of our county have seen the Report.—W. Q.

4—Would estimate its damage, the present year, in this county, at $20,000.—W. Q.

Ray County.

4—Corn, 50 per cent.; wheat, 25 per cent. * * ——. They did not injure the crops very much in this part of the county, but in the eastern and northern parts the amount of damage is at least from $25,000 to to $50,000. Not one-fourth of a crop of corn was raised there, and people will have to suffer.—J. M. B.

Ripley County.

3—No efforts made to overcome its injuries in any shape or form. Your Second Report went into the hands of about one farmer out of every fifty. You may justly suspect we know but little about it.—R. H.

4—The damage in my county I could not approximately say less than $40,000, all crops considered.—R. H.

St. Charles County.

3—No systematic effort made. Some tried hot water, others coal oil, and still others tried to stop them by ditching across the field. Your Report of 1869 is distributed in the county to about the number of thirty, as near as I know.—C. W.

4—By information gathered, I can safely estimate the damage done by the bugs in this county last year at $25,000, which is very low.—C. W.

St. Clair County.

8—Various plans tried, but without much effect. The distribution of your Report has been very limited in this county.—S. H. L. Although seemingly every effort has been made to subdue them, they have come out victorious—complete masters of the situation. Between them and the dry weather we have scarcely anything left to carry us through Winter. Many have despaired and left in disgust, others will remain and renew the combat. The Agricultural Reports spoken of were sent to the circuit clerk for distribution, and it is my opinion that they have generally been injudiciously distributed, finding their way to some favorite to fill up empty spaces in a book case, rather than to the farmer for whom they were intended. But your suggestions contained therein are becoming generally known among the farmers, and will be pretty thoroughly tested the coming season. The case has become desperate—something must be done or all is lost.—C. A. S.

4—The damage from Chinch Bug and drouth, in my township, was $15,000. There are twenty-four townships in the county; all did not suffer as much as this T. (31,) R. (28) west, but the damage may be put down at one-half on an aggregate.—S. H. L. An estimate of the damages done in the county of St. Clair, the past season, by these insects alone would be hard to even approximate. Owing to a combination of causes, wheat, oats and corn were almost an entire failure; three-fourths of which, however, might be attributed solely to the Chich Bug crusade, and the damage resulting therefrom could not fall short of a half million of dollars.—C. A. S.

St. Francois County.

3—Few efforts have ever been made to overcome its injuries. Some have tried to check them, when entering a corn-field from adjoining stubble grounds, by turning them under with a large plow; others, by letting them collect on a few of the first rows, and burning them with torches. Neither of these plans appear to be very effectual. A great many are destroyed to be sure, but enough generally escape to seriously injure the corn crops. The Report mentioned has had a very limited circulation. I don't know of any one who has ever received it.—E. H. P.

[The other correspondents make similar reports].

4—I don't know that I can give you even an approximate estimate of the damage done in this county this year by this insect. I believe there would have been double the corn, a fourth more wheat and oats, and, perhaps, a fourth more grass raised this season had it not been for the Chinch Bug.—E. H. P. Wheat only slightly damaged; corn very materially damaged.—A. J. L.

Ste. Genevieve County.

3—No great effort has ever been made to overcome its injuries as yet, with the exception of pouring coal oil on them, which destroyed both bugs and crop. As to your Second Report, there is nothing known of it here.—J. R. P.

4—This year the corn crop was injured fully one-half; wheat was affected in some places. Other crops were lightly dealt with.—J. R. P.

Saline County.

3—There has been nothing of any consequence done to destroy them. Your Report is received, for which I return my sincere thanks. I am sorry to say that there are comparatively very few of them in this county, and if the knowledge contained in them was universally known in this county, I am satisfied that it would enable us to meet our enemies, the bugs, determined to conquer.—J. P. M'M.

4—I cannot give the required estimate in regard to the damage incurred to crops. Suffice it to say that the chinch bugs and dry weather completely destroyed the oat crop and damaged the corn crop to the extent that there was not more than one-third of the amount raised as formerly.—J. P. M'M.

Scotland County.

3—Not many copies of your Second Report have reached this county.—A. N.

4—I don't hardly know what to estimate the damage done in this county the past season, but I think $100,000 will not fall short of it.—A. N.

Scott County.

4—Their damage in this county approximates $50,000.—H. P. L.

Shelby County.

The crops suffering most are wheat and corn. * * * I have noticed when the wheat covers well the ground (which it may be made to do by thorough manuring) in the Spring, so as to almost exclude the rays of the sun, the chinch bugs do not gather to raise their young there, but seek more open grain. If oats are sowed early and thick, and make a strong, vigorous growth, I have never known the Chinch Bug to hurt them, but if they are thin on the ground, admitting the rays of the sun freely, then oats are a fine crop to raise chinch bugs in. * * *.—J. B. R.

3—No systematic efforts made. I have not been able to hear of the first copy of your Second Report. I suppose they were sent to the county seat and distributed among those living near there.—J. B. R.

4—Cannot give you, with any great certainty, the damage our crops have sustained from chinch bugs the past year, but would suppose the damage to amount to about one-fifth of the value of the crops thus affected.—J. B. R.

Sullivan County.

3—Never saw your Second Report, or saw any person who did see it. The best thing, in my opinion, and it is simply my opinion, is to manure the points and other poor places and burn up the trash around the field and in the fence corners early in the Spring. They never injure a crop on rich land and growing thrifty, as they do on poor land. You would certainly deserve the gratitude of the people of Missouri if you could do anything to relieve them of this pest, or by studying its habits teach us to exterminate them. * * * —S. B.

4—Impossible to estimate.—S. B.

Taney County.

3—None have been made. But very few copies of your reports have been distributed—20 copies perhaps.—J. J. B. There have been no efforts made to overcome its injuries. Your Second Report has been distributed over the county by the State, but not to an extent that one-tenth of the farmers might read it.—W. R. H.

4—I cannot make anything like a close estimate of the value of the produce destroyed, though I should judge that it would amount to $20,000 to $30,000.—J. J. B. * * * From careful calculations, I conclude that Taney county lost over $45,000 by this insect in 1874. These calculations are based upon the census report of 1870 and the assessor's report of 1874. These figures are enormous, and by some may be considered extravagant, but if any one will visit our county and see the state of affairs—starvation staring everybody in the face, stock dying, etc., etc., the effects of dry weather and chinch bugs—they may be convinced.—W. R. H.

Texas County.

3—Some have tried scalding on a few favorite plants; it kills the bug and does not hurt the plant. No other systematic efforts have been made.—R. S. S.

4—I cannot give an estimate of the damage done; say one-half oats, corn and sorghum.—R. S. S.

Vernon County.

3—None whatever. Think there are not more than two or three of the Reports mentioned in the county.—J. A. P.

4—From all the information I have been able to gather in regard to the damage done by this insect, I do not believe it would fall far short of half a million dollars, all crops considered; and if we take into consideration the loss to farmers on account of stock, another half million dollars might be added, as farmers were compelled to sell their stock at a great sacrifice for the want of feed to make them ready for market, or put them through the winter, all of which is chargeable to the Chinch Bug, for although we had a very dry season, yet we would have harvested at least ninety per cent of a corn crop, and there would have been an average yield of wheat and oats.—M. L. M. It is impossible, at this time to closely approximate the damage in dollars and cents sustained by them this year, but may safely place it at one-half of the entire wheat, oats and corn crop of the county, for notwithstanding the drouth which prevailed, we certainly would have harvested a full crop of wheat and oats, and one-half of corn.—J. A. P.

Warren County.

4—Can't make any estimate in figures; would say about 50 per cent. on all uplands; on creek and river bottom lands the damage has been small.—D. P. D.

Washington County.

3—No efforts made to overcome them; very few of your reports in this county.—W. R.

4—As to the damage done by them it is hard to determine; we raised about one-fourth of a crop of corn and oats, and it is the opinion of our best farmers that the bugs hurt it much more than the drouth. Wheat escaped pretty much, as it was very forward. * * * —W. R.

Wright County.

3—There have not been any systematic effort made as yet. We know nothing about your Report. * * *—E. B. G.

4—Corn is damaged, I think, probably, one-third; oats the same; wheat so little I could not estimate it. I have no way of getting at the amount in dollars and cents, but it is immense. My opinion is that Fall plowing, thorough cultivation of the land, and as early planting and seeding as possible, will in a great measure overcome their ravages; such has been my experience.—E. B. G.

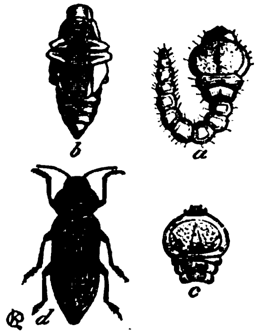
THE FLAT-HEADED APPLE-TREE BORER—*Chrysobothris femorata* * (Fabr.)

(Ord. COLEOPTERA; Fam. BUPRESTIDÆ.)

This insect, owing to the enfeebled condition of many fruit and shade trees—a condition superinduced in part by excessive drouth, in part by defoliation, in the country ravaged by locusts—has been exceedingly injurious all over the western portion of the country. Specimens and complaints have reached me not only from many parts of Missouri, but from Iowa, Kansas, Arkansas, Texas and Nebraska; while the injurious work of this borer was so apparent wherever I traveled that I deem it advisable to publish a more extended account than was given in the Report for 1868.

Considering the fatality of its work and the number of valuable fruit and shade trees which it attacks, few insects are more to be dreaded than this same Flat-headed Apple-tree Borer.

[Fig. 12.]



CHRYSOBOTHRIS FEMORATA: *a*, larva, dorsal view; *b*, pupa; *c*, swollen thoracic joints of larva from beneath; *d*, beetle.

---

* Crotch in his *List* makes *alabamæ* Gory, *4-impressa* Gory, *Lesueuri* Gory, *fastidiosa* Gory, *soror* Lec., *misella* Lec., *obscura* Lec. and *semisculpta* Lec., varieties or synonymes of *femorata*. My own experience so far as it goes in breeding this insect from different trees bears out Mr. Crotch's opinion.

Our oak trees die from year to year. Inquire the cause: The answer is: "O, they cannot stand the influences of civilization!" Search for it yourself and you will find that Chrysobothris has had more or less to do with their death. The townsman prides himself on the thrifty growth of his soft maples or sycamore trees that are to give him shade from the midsummer sun, adorn his lot or line the front of his city residence. After a thrifty growth of two, three or more years, one of the trees suddenly dies, and others soon follow. The cause is discussed: Drouth, packed soil, poor nourishment and a dozen seemingly plausible reasons are conjured up, and ashes, or some other mineral or vegetable substances are placed around the butt in the vain effort to save the remaining trees. Pull off the bark, however, and the real cause is readily discerned, for the surface of the hard wood is literally covered with broad, shallow channels packed with sawdust like casting—channels which Chrysobothris, unseen and unheard, has been making, perchance, since the tree was first set out. Mountain Ash, Linden, Box-elder, Beech, Plum, Pear, Cherry and Peach alike succumb to its attacks,* while the Apple is so subject to its injuries that no man who does not understand this enemy and is not willing to give some little time to mastering it, can hope to succeed in growing apple trees in Missouri; and in reality the time and money spent in planting young apple orchards, especially in the western part of the State, is generally wasted for want of the necessary precautions against this insect.

ITS NATURAL HISTORY.

The natural history of this borer is thus briefly told: The beetle, known as the Thick-legged Buprestian, is very variable in size (my figure at *d* representing a large one), and has been described under a number of different names. It is greenish-black or bronze-colored, with metallic reflections and the underside more coppery or brassy. The more characteristic features are two irregular, impressed, transverse marks across each wing-cover, dividing them into about three equal lengths. This beetle, like all the species of the family (*Buprestidæ*) to which it belongs, is diurnal in habit, and may frequently be found basking in the sun on the trunks of those trees which it more particularly frequents. It begins to appear during the latter part of May and is found all through the Summer months. The eggs, which are pale yellow, and irregularly ribbed or corrugated,* are glued by the female by preference under the loose scales or within the cracks and crevices of the bark, several of them being not unfrequently found together. Yet they must also be laid at times on perfectly smooth bark, as I have found the newly hatched larva in such bark, and under circumstances that would indicate that the beetle sometimes uses her jaws to puncture the tender bark so as to allow the insertion of the egg. The young larvæ hatching from them gnaw through the bark and feed upon the fiber, boring broad and flattened channels, and very soon girdling the smaller trees. When its jaws get stronger it usually bores into the more solid wood, working for awhile upward, and when about to transform it invariably cuts a passage back again to the outside, leaving but a thin covering of bark over the hole. It then retreats, and after packing the excrement around it so as to form a smooth cavity, changes to the pupa state (Fig. 12, *b*). The pupa at first white, by degrees exhibits the colors of the future beetle, and in the course of about three weeks the latter gnaws its way through the thin bark door which, as larva, it had left closing its passage-way. It is a singular instinct that thus teaches the larva, which has powerful jaws, to prepare for the exit of the beetle, which has much more feeble ones; and this instinct is most strikingly illustrated when the infested tree is surrounded with some covering like wire gauze, which is proof against even the jaws of the larva. In such an event, even though the wire touch not the bark, the larva will work its way through the latter, and test in every conceivable way the resistance of the wire, and frequently succumb in the effort to penetrate it. Yet normally this same larva would take every precaution not to penetrate the bark.

---

*I have reared the beetle from Oak, Apple, Mountain Ash, Box-elder, Peach and Pear, and found the larvæ, judged to be the same after critical comparison, in the other trees mentioned.

Whether this borer remains in the tree nigh upon one or two years after hatching, no one has definitely determined. The general impression is that it acquires its full development in a single year. Be this as it may, the larvæ are found of different sizes during the late Summer, and young ones may be noticed even in Winter. In May they are mostly found full grown or in the pupa state. The figures which accompany this article will sufficiently illustrate the appearance of the insect in all its stages, no drawing of the pupa having ever been made before.

NATURAL ENEMIES.

Hidden as this borer naturally is within the retreat of its own making, it is nevertheless hunted and destroyed by wood-peckers, and is not without its insect parasites. Already, in 1856, Dr. Fitch, in his first report as State Entomologist of New York, mentioned having received from that veteran nuseryman, Mr. P. Barry, specimens of the larvæ which had been entirely devoured, so that nothing but the shrivelled skin remained, by a number of small dull whitish grubs, about one-tenth of an inch long, belonging, in all probability, to the *Chalcididæ*, an extensive family of small, parasitic, wasp-like insects; and this Fall I have received what are evidently the same Chalcid larvæ from Mr. R. H. Titts, of Lawrence, Kansas, who gives the following interesting account of their work:

---

* Eggs which I have found on apple trees, and taken for those of this insect, and which accord in appearance with those taken from the abdomen of the female beetle, are about 0.02 inch long, ovoidal, with one end flattened; the shell very thin, and irregularly ribbed.

> The first time we observed these parasites here this season, one of my neighbors remarked that he thought that there was a mistake about a beetle laying the egg that produced the borer. In hunting borers on my own place shortly after I found some of them were sickly or stupid and of a peculiar yellowish color, different from natural. One of these that I had not injured I left in the cavity where found, and closed up the bark, fastening it with wax. After about ten days, on opening it again, I found the parasites at work and the borer dead and partly eaten up; after which I found them frequently in different stages of growth, till the borer was all consumed and the parasites were of the size of those sent you. Those were taken from a cavity with nothing but a part of the skin of the borer left. I did not find them again until about September 1st, after which time I think but few if any borers escaped them. I stopped hunting borers after September 15th, satisfied that the parasites were doing a better job than I could. Others in this section are doing the same. I think that although the borers were much more plenty this season than last there will be less beetles perfected to issue than last year, on account of the parasites. In digging borers I found that if the mouth of the hole in which they had entered the tree was opened the ants would go in and destroy and carry the borer away in every instance, even clearing out the sawdust to get at them.

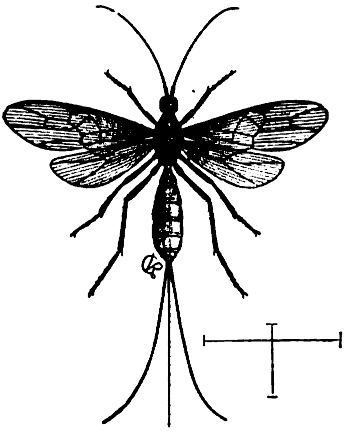
The following letter, received from Mr. C. R. Hoag, of Sedalia, the fore part of December, was accompanied by the same parasite:

> Inclosed I send you the larva of an insect unknown to me; it is the second lot that I have found in a precisely similar situation. I send them in the dust or borings in which they were found; they were found in an apple tree in the bed of the Flat-headed Borer, after he had penetrated the solid wood of the tree. The borer had evidently been destroyed by the small larva, as there was in this latter instance no part of the borer to be found, and in the former but small portions of the skin partly surrounded by the small maggots. I am in hopes that they may prove to be the larva of an insect that is a common enemy to the most destructive pest of the orchard. The ravages of this borer during the past season, in this part of the country, have been unprecedented; it has been a great deal more numerous than the Saperda or Round-headed Borer, that works near the ground. Heretofore (in my experience) they have seldom attacked a healthy and thrifty tree, but have confined their ravages to trees that have received a severe check in transplanting and in bad usage generally. During the past season they have attacked the healthy as well as the unhealthy trees.

I have not succeeded in rearing the perfect fly from these small maggot-like larvæ, but there can be no doubt that it will prove as Dr. Fitch surmised, to belong to the *Chalcididæ*, an extensive family of small 4-winged flies of black or metallic colors, ever on the alert for prey, and sometimes attacking the vegetable feeders at first hand, but more often acting as secondary parasites. In the present instance the minute mother fly must manage to insinuate herself in the burrow of Chrysobothris, and, having reached the borer, pierce the skin and consign her eggs in its body.*

I have bred two other much larger parasites from this borer, both of which belong to the large family of Ichneumons, and reach the borer by means of a long sting or ovipositor. The first of these, which may be called the Cherished Bracon is an undescribed four-winged fly, with the head, thorax, antennæ and legs polished black, the abdomen coral-red, and the wings deep smoky-brown. It expands about 0.65 inch, the body has a length of 0.35 inch and the ovipositor of 0.40 inch. The sting or ovipositor consists of a pale yellow, central terebra, and two stouter black sheaths. The larva, after destroying its victim, spins a yellowish-brown cocoon, flat on two sides, and not unlike a miniture coffin, and the perfect fly issues in Spring through the burrow which the Chrysobothris would have used had it been allowed to live. This parasite is quite common, and though I have reared it on three different occasions, it was in each instance parasitic on Chrysobothris. Specimens sent to the well known Hymenopterist, E. T. Cresson, two years since, were pronounced new, and as no American species of the genus have since been described, I append a description:

[Fig. 13.]



BRACON CHARUS:—Parasite of Chrysobothris.

BRACON CHARUS, N. sp. (Fig. 13)—♀ Length of body 0.35 inch; of ovipositor 0.40 inch; expanse of wing, 0.65 inch. Colors black and deep rufous. Head, thorax, legs and antennæ polished black, the legs and sides of head and thorax with a fine grayish pubescence; trophi also black. Abdomen uniformly deep rufous. Terebra of ovipositor pale yellow, the sheaths black and very faintly pubescent. Wings deep fuliginous with a faint zig-zag, clear line across the middle from the stigma.

Described from 7 ♀'s, all breed from *Chrysobothris femorata.*

The other Ichneumon-fly is somewhat larger, and may be called the Useful Labena. It is the *Cryptus grallator* of Say, subsequently described as *Mesochorus fuscipennis* by Brullé, and belongs to the modern genus *Labena* Cresson. Its body is half an inch long, but the ovipositor has only a length of 0.30 inch. The general color of the body is honey-yellow inclining to brownish, and the wings, which expand nearly an inch, are clouded each with two broad, smoky-brown patches, the light parts being hyaline. The antennæ are reddish-brown, yellow beyond the middle and dark brown toward tips; the ovipositor has the terebra dark and the sheaths yellow with dark brown extremities. Full descriptions of the species under the name of *Labena grallator* have been published by Mr. Cresson* and by Mr. Walsh,† who bred it from hickory wood infested with the larva of *Cerasphorus cinctus*, a longicorn beetle. This fact shows that the Useful Labena is not confined in its attacks to the larva of Chrysobothris, as the other species seems to be. I bred this fly from a Chrysobothris larva infesting an apple tree. It was handed to me by Mr. W. W. Tipton, of Burlington, Kansas, just as it was spinning a delicate transparent cocoon, and Mr. T. felt sure that he had made a grand discovery, and that entomologists had all been wrong in not stating that the flat-headed apple tree borer makes a cocoon. Persons unfamiliar with parasitism in the insect world are apt to jump to such hasty conclusions; and it is only necessary in this connection to say that the Chrysobothris *never does make a silken* cocoon, and that whenever such is found in its burrow, its contents should not be crushed, but allowed to mature and escape.

---

* As this Report is going through the press, my friend, A. S. Fuller, of Ridgewood, N. J., sends me a number of these Chalcid maggots that have preyed on the Chrysobothris larva, and which he received from Prairie City, Mo.

Where the Chrysobothris breeds in felled oak logs or in stumps, it is often destroyed by ants, and they doubtless frequently reach it even in growing trees, especially when the entrance is exposed, as just described by Mr. Titts.

REMEDIES.

In treating of the means to be employed against this Flat-headed borer, one important fact should be borne in mind. The natural breeding place of the insect is undoubtedly in the old decaying oaks of our woods, and I have known it to swarm in old post-oak stumps from which the tops had been felled for a number of years. In fact it prefers partially dead or injured trees to those which are thrifty and vigorous, and partly for this reason, and partly because rough, cracked bark forms a better nidus for the female to lay her eggs, the species is most abundantly found on the southwest side of young apple trees where they are most apt to get injured by sunscald. Sickliness in the tree, injury from the whiffletree or other cause, therefore, predispose to its attacks. It is for this reason that transplanted trees, checked as they are in their growth, usually fare badly. But there is yet one other predisposing cause which few people suspect, and that is reckless and careless pruning, especially of the larger branches. Many a fine orchard tree, and many more city shade trees receive their death shock from the reckless sawing off of limbs without effort being made to heal the wounds by coating with grafting wax, clay or other protecting substances. Around such an unprotected sawed limb, as around the frustum of a felled tree, the rain and other atmospheric influences soon begin their work of causing decay between the bark and the solid wood; and this is but the forerunner of greater injury by insects which are attracted to the spot, and which, though hidden meanwhile from view, soon carry the destruction from the injured to the non-injured parts. Among the insects thus attracted, Chrysobothris plays no mean part, where, had the wounded limb been properly protected, its presence would never have been known. It thus becomes of the first importance, in treating this insect, to keep the young trees vigorous and healthy, and the bark as smooth and as free from injury as possible. Thus in planting a young orchard in this part of the country, where the sun (whether indirectly or directly is for the vegetable pathologist to determine) is apt to injure the bark on the southwest side, it will prove labor well spent to protect them on that side by old paling or lath. Young trees are far more liable to be attacked than old ones, and consequently require greater care.

---

* Proc. Phil. Ent. Soc. III, pp. 400-1.

† Trans. Ac. Sc. of St. Louis, III, pp. 162-3.

A healthy and vigorous tree is not chosen by the female, in depositing, if unhealthy or injured trees are at hand; and when eggs are deposited in trees of the former character, the young borers more often perish—are drowned out. Yet it must not be supposed, on this account, that the insect cannot live in a healthy tree, for he who should act on this principle and take no other precautions against its attacks than good cultivation, would too often discover his mistake. That the insect is seldom if ever found in healthy trees is a necessary truism which often deludes into belief that it cannot attack such. As soon as the borer is at work the tree ceases to be healthy; and while careful culture and protection from other injury are excellent preventives against its attacks, they are not infallible.

As a preventive against the insect's attacks there is nothing better than coating the trunks and larger branches with soap at least twice a year, once toward the end of May and again in July or August. The soap is not only obnoxious to the beetle, but it tends to keep the bark clean and smooth, so as to offer no attraction to the female, and is, withal, beneficial to the tree.

Mr. Henry Shaw, who has had a good deal of trouble from the work of this borer on the young trees in Tower Grove Park, St. Louis, has finally painted them with a mixture of soap, lime and a small proportion of Paris Green. The Green might, I think, be dispensed with, but the lime gives consistency as well as persistency to the soap, and in many of the trees thus treated the larvæ have actually worked their way out only to fall to the ground and perish. A small proportion of glue dissolved in the mixture would add still more to its persistency, and, being gradually dissolved by the rains, not injure the tree.

Other substances have been applied to trees as preventives of the attacks of this insect, and right here the question is naturaly asked, "does it hurt trees to grease them?" The question has been discussed for many years by horticultural bodies, and the individual experience is always conflicting. Indeed, it only admits of a conditional answer, as so much depends on the quality of the grease and the time of year in which it is applied. All greasy substances of such consistence that they will effectually preclude the air for any length of time must necessarily be injurious, whereas, if they soon evaporate or crack open they may be applied so as to produce no injurious effects. Kerosene and axle grease have been used by several prominent Kansas fruit-growers, without injury to the tree, and with satisfactory results in keeping off both borers and rabbits. Coal tar has also been used for the same purposes, and with satisfaction, by many, and is now being extensively tried in the college orchards at Manhattan, and by H. E. Van Deman of Geneva, and others; while pitch tar applied direct to the tree is generally injurious.

From what has already been said we see the importance of keeping the bark smooth, whether by the use of soap or by scraping. The former mode of keeping the bark smooth is altogether preferable, not only because it is more obnoxious to the beetle, but because it is less hurtful to the tree. For it is a fact, exemplified in the experience of Mr. Wm. R. Randall, of Washtenaw county, Michigan, as communicated to the *New York Tribune*, that in scraping trees or in using a knife to cut off the loose bark, the fresh bark is often abraded and bruised so as to form just the nidus needed by the beetle. And Mr. Randall found that the very parts which he had left exposed in this manner by Summer scraping were afterwards well supplied with borers. Scraping, therefore—if it has to be done—should be done early in Spring, before the beetle appears, so that any unavoidable bruising may have time to heal before Chrysobothris is seeking to deposit her eggs.

In Chicago, since the great fire of 1871, a large business has been done in transplanting from the woods immense shade trees, some of them over a foot through. The Flat-headed Borer is playing havoc with many of them, and in despair some of my friends have been at the trouble and expense of wrapping the entire trunk and the larger branches in wire gauze, through which the beetle cannot penetrate. This gauze, if so hung that no part of it touched the bark, would undoubtedly prove a perfect protection; but as it is tacked on, it does not necessarily prevent the female beetle from consigning her eggs to the bark, however much it may prevent the insects already in the tree from issuing; while the cell growth of a single year is very apt to burst it in many places.

But whatever preventive measures be taken, trees should be carefully examined late in the Fall. At this season, or even in the Winter time, the young borers which have just commenced work, are easily detected and destroyed by a knife before they have done much harm. Trees presenting those conditions which I have already stated to be attractive to the insect should be especially watched, and any tree that is suddenly checked in growth should be attended to, as it will probably be found to contain the borer, though the outward signs of its presence may not at first be so manifest. There is a very general impression, also, among orchardists, that this insect is more injurious on low lands than on high lands, and orchards on low land should be more particularly watched.

The presence of the young borer is usually indicated by a discolored spot, a cracking of the bark, or the presence of saw-dust like excrement. It will pay to look over the trees even before Fall, for as early as the latter part of June, in the latitude of St. Louis, the newly hatched worm may sometimes be found just entering, when its presence is frequently indicated by an exuding drop of moisture on the bark, and when it may be destroyed by cleanly cutting out a small slice of bark. Indeed, I would earnestly commend the following advice of Mr. A. A. Briggs, of LeRoy, Barton county, who, after informing me that he has taken out as many as a hundred borers from one small tree, says:

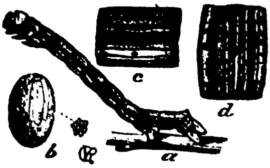
> It is best for those having trees subject to attacks, to look over them every week if possible, or every two weeks at least, from the first of June to Fall, for exudation of sap from the bark, which is a sure indication of their presence. Carelessness in this respect the past season has cost me more than 800 trees, all young.

It is useless to spend time in trying to reach such borers as have already penetrated into the solid wood. They are with difficulty attained, and have already accomplished their principal damage.

CANKER-WORMS.

In further illustration of the remarks made last year on the two species of Canker-worm which have very generally been considered mere varieties of one species, and about which there has been no little confusion,[*] I have prepared figures of each, which, in connection with a few explanatory remarks, will enable their ready distinction.

[Fig. 14.]



SPRING CANKER-WORM :—*a*, full grown larva ; *b*, egg, enlarged, the natural size shown in the small mass at side ; *c*, an enlarged joint, side view ; *d*, do., back view, showing the markings.

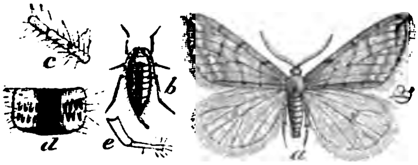
THE SPRING CANKER-WORM (*Anisopteryx vernata*, Peck, Figs. 14, 16. This species, which, from the fact that the great bulk of the moths issue from the ground in early spring, may be distinguished from the other by the popular name here given, is the true Canker-worm originally described as *Phalæna vernata* by W. D. Peck in 1795. This is undoubtedly the species for the most part spoken of in the agricultural journals of the country, and the species best known in the Mississippi Valley.[†] This Spring Canker-worm is distinguished, in the light of recent careful discriminations, by the characters indicated last year, viz.: by each of the first seven joints of the abdomen in both sexes bearing two transverse rows of stiff, red, or reddish-brown, posteriorly directed spines ; by the front wings in the male having three transverse, dusky lines, and a somewhat broader, jagged, pale submarginal line ; and by the whole body in the female, as also the legs and antennæ, being pubescent with pale and dusky hairs—the color being rabbit-gray, or speckled black and white, the abdomen having a medio-dorsal black stripe. The dusky stripes on the front wings of the male, except at costa, and the black stripe on the abdomen, except at each end, are usually more or less obsolete, and indeed the ornamentation of the wings is extremely variable. In many specimens the middle portion of the front wings, within the three dusky lines, is quite pale and mottled with grayish-green, while the basal and terminal portions are marked with brown, thus making the contrast greater. Others again are absolutely without marks whatever, even when fresh from the crysalis; while captured specimens always have the marks more or less effaced on account of the looseness of the scales. The moths rise from the ground for the most part early in Spring, and only rarely the previous Fall. They are crepuscular in habit, and are most active soon after dark in the evening. The female by means of a horny and extensile ovipositor thrusts her eggs, to the number of from 50 to 150, under the loose scales of bark or in any crevice or sheltered place, and is very fond of availing herself for this purpose, of the empty cases of the Rascal Leaf-crumpler* (Rep. 4, Fig. 18.) The eggs are but slightly glued together, and have the form of a rather elongate hen's egg, the shell being very delicate and smooth, though often appearing roughened by transverse and longitudinal, irregular depressions. The larva has but four prolegs, is variable in color, and one of its distinguishing characters is the mottled head (Fig. 15.), and two pale narrow lines along the middle of the back, the space between them usually dark and occupied on the anterior edge and middle of joints 5, 6, 7 and 11 by black marks somewhat in form of X; these marks being represented by dots on the other joints. There are two rather prominent tubercles on top of the eleventh joint, preceded by two white spots. The chrysalis, so far as my comparisons have enabled me to judge, does not differ materially from that of the other species, so that the two species could hardly be distinguished in this

---

[*] This confusion is in part due to the fact that Harris, in his work on Injurious Insects, in treating of THE Canker-worm moth, describes at length, not the species first called the Canker-worm by Peck, but the larger species (*pometaria*). He then uses the following language: "Specimens of a rather smaller size are sometimes found, resembling the figure and description given by Prof. Peck, in which the whitish bands and spots are wanting, and there are three interrupted, dusky lines across the fore-wings, with an oblique, blackish dash near the tip. Perhaps they constitute a different species from that of *the true Canker-worm moth*. Should this be the case, *the latter* may be called *Anisopteryx pometaria*." The term "true Canker-worm" is here misleading, as, while it should evidently apply to the insect originally described by Peck, Harris really applies it to the other species, for which he suggests the name *pometaria*. It is this ambiguity which originally led Mr. Mann to confound the two species, and which led me to make the remarks in the first paragraph on page 29 of my last Report, which—founded on a misunderstanding of Harris's meaning—should be cancelled. As I have already stated, the descriptions in my Second Report are of *vernata*, but the poor figures, which are copied, represent neither species properly, though those of the moths are of *vernata* and those of the eggs *pometaria*. Harris's descriptions of the moths and eggs are of *pometaria*, but those of the larva, and probably of the chrysalis, are of *vernata*.

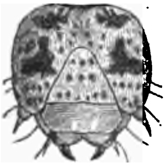
[†] There is in fact no evidence that the other species *pometaria* occurs at all either in Illinois or Missouri, since an examination of the specimens in Dr. LeBaron's cabinet and in my own, proves them all to be the true or Spring species. Indeed, until I received specimens of *pometaria* from Mr. H. K. Morrison and Mr. B. P. Mann, I had never seen the species—the male specimens which I mistook for it in former years being in reality specimens of *vernata* which approach it in the markings of the front wings. That it occurs in the Southwest is, however, proved by the fact that Dr. Packard informs me that he has a fine typical specimen from Dallas, Texas, collected by Mr. Boll.

[Fig. 15.]



SPRING CANKER-WORM:—*a*, male moth; *b*, female do.—natural size; *c*, joints of her antennæ; *d*, joint of her abdomen, showing spines; *e*, her ovipositor—enlarged.

[Fig. 16.]



Enlarged head of Spring Canker-worm, front view.

---

*Senator Elmer Baldwin, an Illinois orchardist of large experience, as quoted by Dr. LeBaron (2d Ill. Rep. p. 106), found these cases so generally used for this purpose that he considered the gathering and burning of the cases one of the best means of destroying the Canker-worms. I can testify, from my own experience, to the frequency with which the cases are used as a nidi.

state. This is the species treated of in my second Report, and which so injuriously affects our apple orchards.

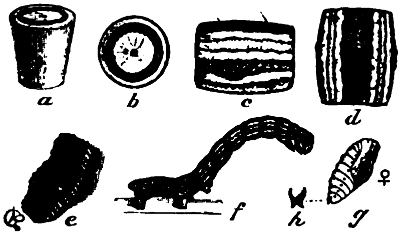
The following descriptions of the immature stages will serve to compare with those presently given of what I call the Fall Canker-worm:

ANISOPTERYX VERNATA, Peck.—*Egg*—Elliptic-ovoid; 0.03 inch long; not quite half as thick, appearing sometimes faintly shagreened, and with irregular, longitudinal depressions; reflecting prismatic colors; shell thin and delicate and quite smooth under the microscope. Deposited in various sized masses in sheltered situations.

Larva—When first hatched of a dark olive-green or brown hue, with a shiny black head and thoracic legs, with a whitish lateral and dorsal band, the latter having a darker central line along it. [These pale stripes are broad, and the dorsal one almost white on the anterior part of each joint, so that the dorsum often appears spotted.] After the first moult, the head becomes lighter and mottled, and the light bands less conspicuous. After the second moult, the bands are almost obliterated and the body becomes more uniformly mottled and speckled with livid-brown; the head becomes still lighter and the prolegs being now large, spread out at almost a level with the venter. After the third (and I believe last) moult, the appearance changes but little. The full-grown larva averages 0.90 inch in length, with an average diameter of 0.10 inch, being broadest on joint 11. It varies from light fleshy-gray to almost black. Head mottled as in figure 16. Ends of body somewhat darker than middle. Joint 1 with a yellowish dorsal shield, the hinder margin in form of a rounded W. Viewed under a lens, the body has a series of eight fine light yellowish, irregular, somewhat broken lines running the whole length of the body, each one relieved by a darker shade each side of it. The two along middle of dorsum are close together, with the space between them usually dark, and occupied at anterior edge and middle of joints 5, 6, 7 and 11 by black marks somewhat in form of x, or of a trefoil; these marks being represented by simple black dots on the other joints. Space between these dorsal lines and the next lowest, lighter, and containing four black pilliferous spots to each joint, the posterior ones rather further apart than the anterior ones which on joint 11 form two larger elevated shiny black spots, [often with white spots in front of them.] Space between lines 2 and 3 darker than any other part of the body. That between lines 3 and 4 lighter than any other part of body, and containing the stigmata which are perfectly round and black with a light center, with a small piliferous spot anteriorly above and below them, and another behind them, this last becoming large on joints 5, 6, 7 and 8. Venter dark and livid at borders, with a pale greenish band along the middle, which has a pinkish patch in it on joints 5, 6, 7 and 8. Legs greenish at base; color of body at extremity. The markings are most distinct on the light specimens.—[Second Report.

Chrysalis—Pale grayish-brown, with a dark green tinge on the wing-sheaths. Remarkable for its robustness and for the large size and prominence of the palpi. A single bifurcate thorn at extremity. Length 0.35 inch; diameter across thorax 0.12 inch. (From the fact that in this description of the chrysalis, made six years ago, no reference is made in my notes to any sexual distinction, and that over a dozen chrysalis shells examined all show the wing-sheaths, I infer that the female chrysalis has wing-sheaths, as in *pometaria*, and that it otherwise, in this state, resembles this last.)

[Fig. 17.]

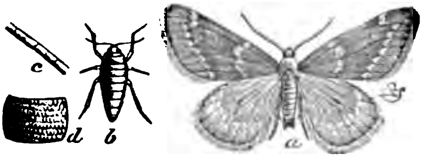


FALL CANKER-WORM:—*a*, *b*, egg, side and top views; *c*, *d*, joints of larva, side and top views, showing markings—enlarged; *e*, batch of eggs; *f*, full-grown larva; *g*, female chrysalis—natural size; *h*, top view of anal tubercle of chrysalis, enlarged.

THE FALL CANKER-WORM (*Anisopteryx pometaria* Harr., Figs. 17, 18.)—This insect is easily distinguished from the preceding, when critically examined. It is, on the average, somewhat larger and more glossy; the front wings of the male have a distinct white spot on the front edge, and are crossed by two pale, jagged bands, along the sides of which there are several blackish dots. The hind wings also have a pale, curved line, more or less distinct, across their middle. The female is uniformly dark ash-gray above, paler beneath, with the antennæ naked, and the legs and abdomen smooth and glistening, and with no extensile ovipositor. Thus it lacks the characteristic spines of *vernata*, the dusky marks across the front wings, and the pubescence in the female; and there are many other minor differences, which are mentioned in the tabular and comparative description of the two insects further on.

The moths rise mostly late in the Fall, but also during the warm weather of Winter, even to Spring. The eggs are tough, with a flattened crown of a purplish color, and having a dimple in the center and a brown ring near the edge: they are not secreted or hidden under scales, but are laid in regular and compact batches, of from 100 to upwards of 200, on the surface of twigs or of the trunk, being fastened by a strong glue, and covered with a slight coating of grayish varnish. The larva is distinguished from that of the Spring Canker-worm by having a dark brown back, and three conspicuous broad, pale yellow lines each side, as well as by having a third pair of prolegs, shorter than the others, on the 8th joint. It develops very rapidly, entering the ground, with favorable weather, within three weeks after hatching; and, singularly enough, suffers but two molts, exclusive of that which takes place underground in transforming to the chrysalis. It is found principally on the Elm, and has not yet been reported from the Mississippi Valley. The female chrysalis is stout and has a little, decurved, bifid thorn on the tip of the body superiorly. It has perfect wing-sheaths, though

[Fig. 18.]



FALL CANKER-WORM—*a*, male moth; *b*, female do.—natural size; *c*, joints of her antennæ; *d*, joint of her abdomen—enlarged.

the moth is wingless. The color is light brown with darker wing-sheaths.

ANISOPTERYX POMETARIA Harris—*Egg*—Length, 0.025 inch; average diameter ⅔ the length; flattened at top where it is somewhat larger than at base. Color of crown purplish-gray, the surface slightly corrugated, with a central dimple and a brown circle just within the border; sides smooth and more silvery, and generally somewhat compressed by pressure of adjacent eggs. Laid in exposed situations, in patches or strips, attached in regular rows, and fastened to the bark in a slightly slanting position so that one edge of the crown is a little above, the other a little below the general level.

Larva—Color pale brownish, marked with dark brown and yellow as follows: The dorsum uniformly dark brown; the sides with three pale narrow lines, more or less irregular and mottled, but always well relieved, the two superior ones white, the lower most yellowish; the subdorsal space between the upper two of these lines, pale; the stigmatal between the lower two darker, especially in middle of the joint around stigmata; the thoracic joints dark with the pale lines somewhat narrower and running up to the head. On joint 11 these lines are constricted or entirely broken, so as to leave a dark band across the middle of the joint. The head is dark brown above and at sides, but paler in front. Cervical shield also dark with the yellow lines running through it. Venter olivaceous, the legs more reddish, there being three pairs of prolegs, the pair on joint 8 only half as long as those on 9, but with perfect hooklets; the thoracic legs quite hirsute and terminating generally in two thorns. Piliferous spots obsolete and with a very few scarcely distinguishable pale hairs, except on anal shield and legs, where they are stouter. Anal shield and legs with brown piliferous dots. The newly hatched larva is pale olive-green with a large pale yellowish head and pale legs. The light lines of the mature larva are, at this early stage, faintly indicated and the piliferous spots give forth short, fleshy, pale hairs. The third pair of prolegs is distinctly visible, but is not used in locomotion. After the first molt the head and thoracic legs become somewhat browner, and the olivaceous green more bluish. After the second molt, the dark colors show much more distinctly.

Described from numerous full grown specimens received from Mr. B. P. Mann, others received from Dr. A. S. Packard, Jr., and a larger number of all ages reared by myself from the egg.

It varies somewhat in intensity of color, and in some the light and dark browns are not so sharply separated, but the dorsum is generally uniform and the three lateral yellow lines distinct. Up to the second or last molt, the general color is, with rare exceptions, greenish; but in the last stage, the dark-brown or black predominates, and is sometimes so general that there is but the faintest trace of the superior yellow lines. Occasional specimens, even when young, show in the subdorsal dark space, one, and in the dorsal dark space, two, very fine and faint pale lines. Differs entirely from *vernata* in lacking most of the characteristic spots in front of the head of that species, and the two pale transverse marks; in having the dorsum darker instead of lighter than the rest of the body; in lacking the medio-dorsal pale lines and the characteristic x-like marks; in the broader, more conspicuous pale lateral lines, and in the subdorsal space being darker than the stigmatal; and lastly in the additional, though atrophied, abdominal prolegs. It is a smoother larva.

Chrysalis—Color light brown, with the wing-sheaths, a medio-dorsal shade, sutures and stigmata darker. Length 0.30—0.35 inch; stout, with the wing-sheaths and their veins distinct in the female; a dorsal, bifid, decurved tubercle near the tip of anal joint.

PRACTICAL CONSIDERATIONS.

The practical man may consider the illustration of these differences as unimportant and trivial, however much they may interest the entomologist. Yet it is of much practical importance to know how to distinguish between these two insects. From present knowledge of the subject, it is highly probable that, just as the moths of the one species appear mostly in early Spring, and of the other mostly late in the Fall, so each is, in a general sense, confined to particular plants—the Spring species preferring our fruit trees, and the Fall species preferring the Elm. Thus the time to put forth our efforts to catch and destroy the wingless moths will vary according to the nature of the tree to be protected and the insect to be dealt with.

In the case of the Spring species, the scraping of loose bark from the tree and otherwise cleansing it of dead leaves, cocoons, larva-cases, etc., a short time before the hatching of the worms, or before the buds of the tree commence to open, will prove an effectual preventive measure; as thereby many of the eggs will be destroyed. Moreover, a tree kept clean of loose bark will be less subject to its attacks. The same argument will not apply to the Fall species, which attaches its eggs in any exposed position. It would seem, also, that the mode of trapping the moths will have to be somewhat modified, according to the species to be dealt with; for while Dr. LeBaron found the tin and rope trap described last year so effectual with the Spring Canker-worm, it does not appear to afford any barrier to the Fall species, judging from the following notes, kindly furnished by Mr. Mann:

Nov. 8, 1873. Warm last night, with rain, which still continues. Found 25 ♀ and one ♂ *pometaria*. Found 4 of the ♀ above the LeBaron zinc band.

Nov. 9. Found 2 ♂, 87 ♀ *pometaria*; 2 ♀ above the zinc band.

Nov. 12. Snow last night, followed by cold sleet. Found 9 ♀ *pometaria*, 1 above the zinc.

Nov. 15. Only 6 ♀ *pometaria*; none above the band. Last three days freezing cold, but not stormy.

Nov. 18. Several days of rain and snow. 1 ♀ *pometaria*.

Nov. 22. 6 ♀, 2 ♂ *pometaria*.

Dec. 4. Yesterday thawing, to-day also. The weather since Nov. 22 has been cold, with occasional snow, and the ground has been frozen, and I have failed to find any *Anisopteryx pometaria*; but to-day I caught 11 ♂, 102 ♀, 2 ♀ above the zinc band. I have no doubt that the smallness of the number of ♀ found above the bands of zinc is due to my promptness and diligence in detecting and destroying them before they have had time to mount the tree; because, according to the theory on which the experiment was tried, the ♀ ought to be found on the outside of the strips, if their ascent has been prevented by them; while in fact, (excluding those found on the house or fence, etc.,) the majority of the ♀ have been caught before they reached the bands; further, because I tried the experiment with 3 or 4 ♀, and found that as soon as they reached the top of the band, they climbed over it, and began to ascend the tree. Being satisfied by this positive evidence, which would outweigh any amount of negative evidence from those who have *not seen it*, I put printers' ink on the outside of the zinc strips. (I found that the ink was more quickly chilled or dried by being on the zinc, so last Winter I pulled it off and inked paper bands applied closely to the trunk).

Dec. 5. Colder. 25 ♂, 71 ♀ *pometaria*. The greater proportion of the ♂ than formerly is explained by considering that most of them were stuck to the ink; whereas formerly they could hide away by day. It is to be noticed that although some imagos appeared before the frost, they only swarmed after it, justifying the farmers' saying that you must have a frost to bring the Canker-grubs out.

Moreover, it is quite important that the orchardist be able to distinguish these Canker-worms from a number of other looping worms which greatly resemble them, but which produce moths which are winged in both sexes. "For if he mistakes some other span-worm which produces winged females as well as winged males, for the genuine Canker-worm which is apterous in the female moth state, it becomes very obvious that all his efforts to try and prevent the ravages of the spurious Canker-worm by the most approved and well-tried methods, will not only fail most absolutely, but he will lose all faith in such remedies, and may perchance, if he is given to the use of the quill, vent his wrath and disappointment by sending to some one of the horticultural journals of the land, a pithy article 'based upon FACTS [?] and EXPERIENCE,' showing up the utter worthlessness of the Canker-worm remedies!

"It is from such lack of true knowledge that the City Fathers of Baltimore, Maryland, went to the useless expense of furnishing oil troughs for all their large elm trees which were being defoliated, under the delusive idea that the insect committing the ravage was the Canker-worm; whereas it turned out to be the larva of a little imported Beetle (*Galeruca calmariensis*, Fabr.), the female of which has ample wings, and can fly as readily as a bird from tree to tree."—[2nd Rep., p. 95.

I will now give more detailed comparative descriptions of these two insects in their different stages, those of the moths being but slightly altered from the original comparisons drawn up by Mr. Mann, to whom I am under obligations for specimens of *pometaria* in all stages, and for the use of his notes.

ANISOPTERYX VERNATA.	ANISOPTERYX POMETARIA.
Egg.	
Elliptic-ovoid, the shell of delicate texture and quite yielding; generally appearing shagreened or irregularly impressed; nacreous, and laid in irregular masses in secreted places.	Squarely docked at top, with a central puncture and a brown circle near the border; of firm texture, and laid side by side in regular rows and compact batches.
Larva.	
No prolegs on joint 8.	With a pair of short prolegs on joint 8.
Head distinctly mottled and spotted, the top pale, and two pale transverse lines in front.	Head very indistinctly spotted and dark on top.

Body with eight superior, narrow, pale, longitudinal lines barely discernible, the two lowermost much farther apart than the others.	Only six superior broad and very distinct pale lines, those each side equidistant.
Dorsum pale, with median black spots; subdorsal region dark; stigmatal region quite pale.	Dorsum dark, without ornament; subdorsal region pale; stigmatal region dark.
Piliferous spots quite visible and large on joint 11, where the pale lines generally enlarge into white spots immediately in front of them.	Piliferous spots subobsolete.
When newly hatched *dark* olive-green or brown, with black shiny head and cervical shield.	When newly hatched *pale* olive-green, with very pale head and cervical shield.

Chrysalis.

Same as *pometaria*, so far as known.	Stout, the female with wing-sheaths, and a small decurved horn, bifid at extremity near tip of abdomen, superiorly.

Imago.

The first seven joints of the abdomen of both sexes bear each upon the back two transverse rows of stiff, red spines, pointing toward the end of the body.	The first seven joints of the abdomen of both sexes with no spines upon the back.
Front wings of male, on upper surface ash-colored or brownish gray; the whitish spot found on the front wings of *A. pometaria* is wanting.	Front wings of male on upper surface ash-colored with a faint purplish reflection, and with a distinct whitish spot on the front edge near the tip.
The whitish bands found on the front wings of *A. pometaria* are wanting, but there is a jagged, subterminal white band in most specimens, running out to the apex, where it is lined externally with dark brown.	[Front wings] crossed by two jagged whitish bands; the outermost band has an angle near the front edge. The white bands are often entirely wanting, in which case only the whitish spot near the tip remains.
There are three interrupted, dusky lines across the front wings, instead of two pale lines, as in *A. pometaria*. Sometimes these lines are only indicated by dark spots on the costa and by blackish dashes on the median nervure; rarely are they very distinct throughout their whole extent.	Along the sides of the whitish bands there are several blackish dots, each on a nervure, and all generally connected together by a dusky band, which includes them, and runs on that side of each whitish band which is towards the other. These bands remain visible when the whitish bands are wanting.
There is an oblique, blackish dash near the tip of the front wings, crossing a nervure; and there is a distinctly interrupted, or nearly uniform, continuous line of blackish along the outer margin, close to the fringe.	Within the angle of the outermost whitish band, near the costa, there is a short, faint, blackish line, following a nervure; and there is a row of black dots along the outer margin, close to the fringe.
The hind wings are pale ash-colored, or very light gray, with a faint blackish dot near the middle.	The hind wings are pale ash-colored, or light gray, with a faint blackish dot near the middle.
The white band found on the hind wings of *A. pometaria* is wanting.	In most specimens a curved white band is plainly visible on the hind wings, about half way between the middle and the end

On the costa, opposite the beginning of the outermost dark band of the upper surface, and on the edge of the disk, are dusky spots on the lower surface of the wings. Along the median nervure beneath is a dark line. These marks are sometimes indistinct.	The outermost pale band of the front wings, with its angulation, and the band of the hind wings are also visible on the under side of the wings. Within the angulation is a brown or blackish spot on the costa.
	Antennæ of male more serrate and hairy; the serrations darker.
Antennæ of female pubescent with the joints constricted in middle.	Antennæ of the female naked, with the joints only half as long as in *vernata*, and uniform in diameter.
Abdomen terminating in a retractile ovipositor; rather acutely tapering behind.	Abdomen not terminating in an ovipositor; rather bluntly tapering behind.
Whole body and legs of the female pubescent, clothed with whitish and brown or black dentate scales or hairs; general coloration not uniform. A black band along the middle of the back of the abdomen, often interrupted on the second to seventh joints; with a whitish patch each side of its front end; the spines frequently giving a reddish appearance to the part they occupy.	Whole body and legs of the female smooth, clothed with glistening brown and white truncate scales intermixed, giving it an appearance of uniform shiny dark ash-color above and gray beneath.
Crest of prothorax and mesothorax black.	
Of a rather smaller size than *pometaria*, the wings of the male expanding from 0.86—1.30 inches, and the female measuring 0.20—0.35 inch in length.	The wings of the male expand from 1.05–1.35 inches; and the female measures 0.25 to 0.40 inch.

CONCLUSION.

We thus have two distinct species of canker-worms, differing not only in habit, but differing so much structurally in all states (except, perhaps, the chrysalis state) that they may at once be distinguished from each other. In contrast with the soft delicate ovoid eggs secreted in irregular masses, the 10-legged larva, and the spined and hairy moths of *vernata;* we have the tough, flower-pot-shaped eggs, laid in exposed regular masses, the 12-legged larva and the spineless, smooth moths of *pometaria;* and the specific structural differences are still apparent when we come to examine the genital armature of the males. It is really remarkable that these differences have remained so long unnoticed, especially in those parts of the country where *pometaria* abounds. As a fitting conclusion to what I have written on this subject, it gives me pleasure to be able to reproduce, through the courtesy of Mr. Mann, who copied them for me, portions of the original premium essay on the Canker-worm, by Mr. Peck, not only because of the value and accuracy of the observations, but because they show so conclusively that it was the true or Spring species upon which the essay was based.

Extracts from the original Essay on the Canker-worm, by William Dandridge Peck, published in 1795.

To cultivate a knowledge of insects, merely for their splendid plumage or gorgeous colors, is indeed a contemptible employment; but to inquire into the purposes of their being and the part they are destined to perform in the economy of Nature, is to study the wisdom of that Omniscient Being whose mandates they execute with the greatest exactness. * * * *

These insects (the Canker-worm) appear in the Spring earlier than any other of the moth tribe—about the middle of March. Their rise, however, from the earth will be delayed or hastened according to the temperature of the atmosphere and state of the soil. They are found under a double form, the males being furnished with, and the females being destitute of, wings. This circumstance necessitates the females to ascend the tree by its trunk in order to deposit their eggs upon the branches. The males by their wings resort to them, and are found in the evenings hovering round the trees. In three or four days after they begin to rise, they are found sub-copula. This office is performed in eleven or twelve days after their first appearance. The males die and disappear. In thirteen days the females deposit their eggs. These they place in the crannies of the bark in the forks of small branches; and where there are spots of moss upon the smaller limbs they seem most fond of insinuating themselves into the cavities between its leaves. For this purpose the females are furnished with a tube through which the egg is passed, with which she investigates the appertures in the bark or moss, and ascertains their depth. * * * Each female lays at a medium an hundred eggs. The ultimate purpose of their being thus performed, they die.

The egg is elliptic, 1-30 of an inch in length, of a pearl color, with a yellowish cast. As the included animal advances in ripeness the egg assumes a brownish hue; in twenty days is of a lead color, and with a moderate magnifier the larva may be seen to move in the shell. On the twenty-first day the larva breaks from its prison, is one line in length, and furnished with ten feet—six anterior and four posterior. * * * They are commonly hatched about the time that the *red currant* is in blossom, and the apple-tree puts forth its tender leaves. * * *

On the twenty-sixth day from their quitting the egg they begin to cease from feeding and descend by the trunk of the tree; when arrived at its foot they with great labor penetrate the earth near it to different depths; and this appears to depend in part on the quality of the soil and in part on the vigor of the animal. In grass land they are found from one to four inches beneath the surface, and when the trees stand in plowed land, if the soil be loose, they penetrate to the depth of seven or eight. * * *

It has been observed above that they descend by the trunk of the tree; all which descend in this manner enter the earth near it. This is their natural and regular course, and hence the greatest number of them is found within a circle, whose radius extends four feet from the trunk. But some will always be found at a greater distance, according to the area which the tree covers; for if dislodged by wind or accident at the time when they are about to seek the earth, they cover themselves near the spot they fall on. In recurring to the structure of the female insect we see at once the reason why they are naturally confined to a small circle.

The larva or catterpillar is, when full grown, about nine lines long; the head pale, marked on each side with two transverse blackish stripes; the back ash-colored, marked lengthwise with small, interrupted dusky lines; the sides blackish, with a pale line along the length of the body; there are two white spots on the last segment of the body; the abdomen or underside is ash-colored. * * *

The chrysalis state comes on in twenty-four hours after the larva has penetrated the earth; and it appears that the insect is soon perfect, since a course of warm weather has been found to raise some of them from the earth in the month of November. While they are in chrysalis they are uninjured by frost. Their natural and regular time of rising is about the middle of March, but happens sometimes as early as the twelfth, and is sometimes retarded to the twenty-fourth, according to the warmth or coldness of the season. They continue to rise for a longer or shorter time, according to the greater or less depth at which they lie, and the extrication of the frost from the earth—commonly from twenty to thirty days. * * * Like others of the moth kind, they are active only in the night, and in the day time sit close to the bark of the tree, whose color is so similar to theirs that they are not seen without near inspection. * * *

The principal check provided by Nature, upon the too great increase of this insect is the *Ampelis garrulus* of Linnæus, called by Mr. Catesby, the Chatterer of Carolina, and in the Rev. Doctor Belknap's History of New Hampshire, Cherry-bird. This bird destroys great numbers of them while in the larva state. Another check is a disease which may be called *Deliquium*, and is probably occasioned by a fermentation of their food. In this disease the whole internal structure is dissolved into a liquid, and nothing is entire but the exterior cuticle, which breaks on being touched.

The Canker-worm is said to have been observed first in the Southern States, where it is probably a native. It is certain it must be spread by some means independent of itself, since the female, by the privation of wings, is forbidden to range.

It may have been introduced into New England by the importation of trees from the Southern States, on which the eggs were deposited; or disseminated in the larva state, in all populous parts of the United States, by falling from trees upon carriages and travelers passing under them.

This conjecture is rendered probable by its being found in all places which have intercourse with such parts as are infected with it, and by its being unknown in new settlements.

THE GRAPE PHYLLOXERA.

The following notes on this insect are intended to supplement the article in the Sixth Report, and should be read in connection with said article. It is my desire to give a record of observations and discoveries, in the matter of Phylloxera, with as little repetition of what has previously appeared in these reports, as is consistent with intelligibility.

COMPLETION OF ITS NATURAL HISTORY.

During the year the natural history of the species has been all but completed; as I predicted it would be, after Balbiani had paved the way by his remarkable biological studies of the European Oak Phylloxera, made a year ago. It turns out, as was expected, that the Grape Phylloxera agrees with its oak congener in producing wingless and mouthless males and females; and the problematic winged individuals, with short bodies and relatively long wings and members, which individuals were looked upon by myself and others as the possible males, must necessarily be abnormal females.* The sexual individuals have now been traced in the Oak and Grape species (*quercus* and *vastatrix*) in Europe by Balbiani; and I have traced them in three species (*Rileyi*, *vastatrix* and what is probably *caryœcaulis*) in this country.

The life-history of the Grape Phylloxera may be thus epitomized: It hibernates mostly as a young larva (Rep. 6, Fig. 5,) torpidly attached to the roots, and so deepened in color as generally to be of a dull brassy-brown, and, therefore, with difficulty perceived, as the roots are often of the same color. With the renewal of vine-growth in the Spring, this larva molts, rapidly increases in size, and soon commences laying eggs. These eggs in due time give birth to young, which soon become virginal, egg-laying mothers, like the first; and, like them, always remain wingless. Five or six generations of these parthenogenetic, egg-bearing, apterous mothers follow each other; when—about the middle of July, in this latitude—some of the individuals begin to acquire wings† These are all females, and, like the wingless mothers, they are parthenogenetic. Having issued from the ground, while in the pupa state, they rise in the air and spread to new vineyards, where they deliver themselves of their issue in the form of eggs‡ or egg-like bodies—usually two or three in number, and not exceeding eight—and then perish. These eggs are of two sizes, the larger about 0.02 inch long and the smaller about three-fifths of that length. In the course of a fortnight they produce the sexual individuals, the larger ones giving birth to females, the smaller to males. These sexual individuals are born for no other purpose than the reproduction of their kind, and are without means of flight, or of taking food, or excreting. They are quite active and couple readily; one male being capable, no doubt, of serving several females, as Balbiani found to be the case with the European *quercus*. The abdomen of the female, after impregnation, enlarges somewhat, and she is soon delivered of a solitary egg, which differs from the ordinary eggs of the parthenogenetic mother only in becoming somewhat darker. This impregnated egg gives birth to a young louse which becomes a virginal, egg-bearing, wingless mother, and thus recommences the cycle of the species' evolution. But one of the most important discoveries of Balbiani is that, during the latter part of the season, many of the wingless, hypogean mothers perform the very same function as the winged ones; *i. e.*, they lay a few eggs which are of two sizes, and which produce males and females, organized and constructed precisely as those born of the winged females, and, like them, producing the solitary impregnated egg. Thus, the interesting fact is established that even the winged form, is by no means essential to the perpetuation of the species; but that, if all such winged individuals were destroyed as fast as they issue from the ground, the species could still go on multiplying in a vineyard from year to year. We have, therefore, the spectacle of an underground insect possessing the power of continued existence, even when confined to its subterranean retreats. It spreads in the wingless state from vine to vine and from vineyard to vineyard, when these are adjacent, either through passages in the ground itself, or over the surface. At the same time it is able, in the winged condition, to migrate to much more distant points. The winged females, as before stated, begin to appear in July, and continue to issue from the ground until vine growth ceases in the Fall. Yet they are much more abundant in August than during any other month, and on certain days may be said to literally swarm. Every piece of root a few inches long, and having rootlets, taken from an infested vine at this season, will present a goodly proportion of pupæ; and an ordinary quart preserve jar, filled with such roots and tightly closed, will furnish daily, for two or three weeks, a dozen or more of the winged females, which gather on the sides of the jar toward the light. We may get some idea, from this fact, of the immense numbers that disperse through the air to new fields, from a single acre of infected vines, in the course of the late Summer and Fall months.

---

* Balbiani (*Comptes Rendus Ac. d. Sc.*, Paris, September 21, 1874,) after a careful examination of these individuals, says that they play no special physiological rôle in the phenomena of reproduction; but that they have all the characters of the normal winged females, with, however, the generative organs atrophied; and may, in part, be compared to the neuters among bees and ants.

† During this virginal reproduction a gradual reduction in vitality and prolificacy is observable from generation to generation. Around the first virginal mother the eggs may accumulate by the hundred; but they decrease in number in succeeding generations until the individuals which—whether winged or wingless—lay the sexual eggs, give birth in no instance, yet recorded, to more than eight. From the true female again, or at the end of the cycle, only a solitary egg is born.

‡ It has been a question whether the egg-like bodies from these winged females, or from the wingless mothers which produce them, can properly be called eggs, and M. Lichtenstein has proposed to call them pupæ, because they give birth, not to a larva but a perfect insect. The term "pupa" is, however, manifestly incorrect as applied to these bodies, because, when first laid, they are transparent with a homogeneous content; while the sexual individual develops within the covering very much as the embryonic larva develops within the egg. In fact we have here. not, as in *Hippobosca*, a larva hatching and nourished in the ♀ abdomen until full grown and contracting to a pupa before delivered; but an insect hatching and undergoing its entire development within the egg-covering after the egg is delivered Thus while the covering might more properly be called a sac just before the male or female creeps out of it, it is more truly an egg when first delivered; and so it is best to call it.

If to the above account we add that occasionally individuals abandon their normal underground habit, and form galls upon the leaves of certain varieties of grape-vine, we have, in a general way, the whole natural history of the species.

DIFFERENT FORMS PRESENTED BY THE SPECIES.

The differences in form and habit which the species presents will be best appreciated by recapitulating them in tabulated form:

1—The gall-inhabiting type (*gallicola*—Sixth Rep., Fig. 4,) forming galls on the leaves, and presenting:
    a—The ordinary egg (*ibid*, Fig. 4, *c*,) with which the gall is crowded:
        b—The ordinary larva (*ibid*, Fig. 4, *a*, *b*):
            c—The swollen, parthenogenetic mother, without tubercles (*ibid*, Fig. 4, *f*, *g*, *h*):
2—The root-inhabiting type (*radicicola*, Sixth Rep., Fig. 5,) forming knots on the roots, and presenting:
    aa—The ordinary egg, differing in nothing from *a*, except in its slightly larger average size:
        bb—The ordinary larva, also differing in no respect from *b*:
            d—The parthenogenetic, wingless mother, the analogue of *c*, but covered with tubercles (*ibid*, Fig. 5, *f*, *g*):
            e—The more oval form, destined to become winged (*ibid*, Fig. 5, *e*):
            f—The pupa, presenting two different appearances (*ibid*, Fig. 6, *e*, *f*, and Fig. 8, *a*):
            g—The winged, parthenogenetic female, also presenting two different appearances (*ibid*, Fig. 6, *g*, *h*, and Fig. 8, *b*):
    h—The sexual egg or sac deposited by *g*, being of two sizes, and giving birth to the true males and females:
            i—The male:
            j—The true female:
    k—The solitary impregnated egg deposited by *j*:
        bbb—The larva hatched from *k*, which, so far as known, does not differ from the ordinary larva, except in its greater prolificacy:
        l—The hibernating larva (*ibid*, Fig. 5 *b*), which differs only from *b* in being rougher and darker.

Thus the insect is found in at least a dozen distinct forms, excluding the variation that some of these forms are subject to; while, in addition to what we already know of its power to change its habit, I will add that Balbiani reports having succeeded, by gradually accustoming the species to new conditions, in making the progeny of the root-louse live above ground, where, singularly enough, they did not form galls, but dwelt on the under side of the leaves like the Oak species. This change of habit was brought about after the third generation; and while it may probably never occur in nature, and finds its parallel in the well-known instances of rearing several generations on a thick piece of root in tubes and bottles, yet it forcibly illustrates the power of adaptation and change which the species possesses. It may be also stated in this connection, that Dr. L. Rössler, of Klosterneuburg, Austria, has found the insect, of all sizes, above ground, under the loose bark near the base of the vine—a position which is quite exceptional for it to assume.

SPECIFIC IDENTITY OF THE GALL-INHABITING AND LEAF-INHABITING TYPES.

The reader of these reports will scarcely need to be told that the two types above mentioned are identical; but as the fact has been called in question by a few of our prominent grape-growers, I repeat here what I wrote on the subject not long since for the New York *Tribune :*

In the October number of the monthly report from the Department of Agriculture at Washington, there is the record of an experiment by Townend Glover, Entomologist to the Department, the object of which is, in Mr. Glover's language, "to prove the identity of the Pemphygus [Pemphigus] vitifoliæ or leaf-gall-louse, of Fitch, with the Phylloxera vastatrix, or root-gall louse,* so injurious at present to the vineyards in France, and in parts of this country also." This is the experiment referred to in the *Tribune* of the first week of March last, and the item detailing it, shows, as I had anticipated, that no galls were produced. It also shows that "we cannot give the names of the vines [experimented with] as accidentally the labels were thrown away by the laborer when he removed the dead vines," and, though closing with a confession that the experiment decides little or nothing, it nevertheless appears to strengthen the belief held by many, that the leaf louse and root-louse are not specifically identical.

The item has been very generally copied in our agricultural papers, and has been widely disseminated over the country, through the monthly report, in which it first appeared. The average editor and the average reader of our agricultural and horticultural journals have not, nor can they be expected to have, nor do they pretend to have, profound knowledge in every specialty; and for these reasons items of this kind, coming from the fountain head, have a great influence in shaping popular opinion. It is all the more necessary, therefore, that information coming from such a source be trustworthy.

---

* This term, which is original with Mr. Glover, should be discountenanced, as the term "gall," strictly speaking, applies only to abnormal vegetable growths, caused by insects dwelling within them; and not to mere swellings induced by insects which always live exposed.

The ostensible object of the experiment described, was to prove the identity of the Phylloxera which forms galls on the leaves of the Grape-vine, with that which causes the swelling and rotting of the roots of the same plant. The inference from the attempt is, that the two forms had not so far been proved specifically identical. Yet the question had long since been settled by eminent observers, whose care and thoroughness have won for them respect and authority. Already in 1868, that eminent entomologist, J. O. Westwood, of England, who examined both types, announced that he could not perceive in them specific difference, and in the Fall of 1870, the specific identity of the two types was proved by myself, by obtaining root-lice (*radicicola*) direct from gall-lice (*gallicola*), and by showing that the young of the latter as they are carried to the ground by the fall of the leaf, creep on to the roots to hibernate, and there assume the characters of the root-inhabiting type. But anterior to my own experiments, the specific identity of the two types was thoroughly proved by three different and independent observers in France, and their observations are on record in different numbers of the *Messager du Midi.* Since then the identity of the two types has been confirmed in the most conclusive and emphatic manner by several observers, Maxime Cornu, more especially, having recorded in detail, in the *Comptes Rendus* of the Paris Academy of Science, his thorough and painstaking experiments, in which he not only institutes the most careful and anatomical comparisons, but records having actually watched the process of change from the one to the other. These articles, though originally appearing in the *Comptes Rendus*, have been copied in more popular works, while the facts have been recorded in this country. Finally, the specific inter-relation of the two types was still more firmly established last Winter by the production of an abortive gall from a root-louse.*

Indeed, the question has for some time been considered definitely settled by all who are well informed on the subject. Yet while further proof of the identity of the two types was scarcely necessary, all endeavors by experiment to obtain gall-lice from root-lice are praiseworthy and interesting, if they are carefully made. But the value of experiments like those made at Washington, where no intelligent choice is made of the particular varieties of vine employed, and where not even the names of the varieties are known, will appear from the following facts, which are well understood by all who have kept *au*

---

* See Sixth Mo. Rep., p. 41.

courant of the Phylloxera question: The gall-inhabiting type of the Grape Phylloxera is but a dimorphic, agamous and apterous female form, never becoming winged, never producing any males, and not at all necessary to the perpetuation of the species. It can only flourish on a few varieties of vine, and on the others it makes abortive attempts or no attempts at all to found galls. In short, there are but few among the many cultivated varieties of the Grape-vine upon the leaves of which the Grape Phylloxera—under conditions which we shall probably never understand—can form galls; while on the large majority of our varieties, such as Norton's, Catawba, Gœthe, Diana, Cunningham, Iona, Isabella, Martha, Maxatawney, Ives, North Carolina, etc., we may justly conclude that the insect cannot form galls, since galls are never found upon them. The attempt, therefore, to make the insect produce galls upon such vines must necessarily prove futile, and in the light of present knowledge, the first requisite in any experiment having such object, should be an intelligent choice of varieties.

Even where those vines are employed—as Clinton and varieties of *Riparia* and *Cordifolia*—upon which galls can be most readily produced, the experiment of producing galls upon them from root lice, will not be likely to succeed, and the failure to thus produce galls must count for little or nothing against the results already obtained.

The gall-louse is but a transient form, by no means essential to the existence of the species, and its existence depends not alone on the nature of the vine, but, as already stated, on other yet unknown conditions, which cause it to be abundant on a vine one year and perhaps entirely absent the year following. Now, these conditions may not obtain in one out of a hundred experiments, and the number of fruitless efforts properly and intelligently made to obtain these galls, both in Europe and this country, attest the difficulty here encountered. I have even found the greatest difficulty in producing galls from the progeny of the gall insects themselves, in my experiments in-doors.

Loose experiments, especially when, as in this instance, they convey wrong impressions, do more harm than good. I hope, therefore, that the facts here stated will serve to offset the article in the Department Reports.

WHERE DO THE WINGED FEMALES LAY THEIR EGGS?

Last Fall I was not a little surprised by a letter from my friend Lichtenstein, of Montpellier, France, under date of September 6th, announcing the fact that he had just discovered that the winged Grape Phylloxeræ congregate in immense numbers on the leaves of the Chermes Oak (*Quercus coccifera*), a small shrubby tree growing on the higher lands of that country: further, that they make a nidus of this tree, to the leaves of which they consign the few eggs in their abdomen. Notwithstanding my high appreciation of his knowledge regarding the different species of Phylloxera, I immediately wrote to my friend that he must be wrong, as we have no Chermes Oak in America, and I had never found the winged Grape Phylloxera upon any of our oaks, though I had frequently beaten it in August from vines. From an examination of specimens which accompanied the letter, I suggested that he had mistaken the European Oak species (*quercus* Fonsc.) for the Grape species (*vastatrix*). Subsequent careful studies by Balbiani and others, proved this suggestion to be correct. Yet M. Lichtenstein still believes that he not only found the winged females of two species that infest the Oak there, but that among them there were some of the Grape-vine species. In that event, the following conclusions are inevitable: 1st, as the Chermes Oak does not occur here, the winged Grape Phylloxera in America, and in all countries outside the range of that oak, must make a nidus of some other tree; 2d, the young (progeny of the sexual individuals) brought forth on such trees when they are far away from vineyards, must inevitably perish; because they are not winged, and have feeble power of locomotion. From the fact that I have beaten from our Post Oak, a large winged Phylloxera answering to the description of *Ph. caryæcaulis* Fitch, which makes a large, irregular, smooth gall on the leaf-stalk of the Bitternut Hickory, and which certainly does not inhabit oak trees, I am the more disposed to believe that chance individuals of the Grape species may also be found on oaks,* and am thus forced to the following conclusions: The winged females of Phylloxera (and the same will hold true of two allied genera—*Pemphigus* and *Eriosoma*) are not drawn by instinct to any particular plant, but are wafted about and will lay their eggs, or, in other words, deliver themselves of their issue, wherever they happen to settle. If this is upon their proper food-plant, well and good; the young live and propagate: if not, they perish. We should thus have the spectacle of the species wasting itself to a greater or less extent, just as most plants annually produce a superabundance of seed, the larger proportion of which is destined to perish. From a large number of facts that have come to my knowledge in insect-life I actually believe this to be the case; and, if so, it adds one more weighty reason to those I have already given why the insect is so injurious in France, and explains its rapid multiplication in the thickly planted vine districts of that country. There, few winged insects would fail to settle where their issue could survive; while in our country there must be, on this hypothesis, an immense number annually perishing in the large tracts of other vegetation between our scattering vineyards.

---

* This hap-hazard, wandering habit is well known to belong to several closely allied Aphidians, and the winged female of *Pemphigus vagabundus* Walsh, which forms a large coxcomb-like gall on the Cottonwood, and can breed on no other tree, is often found in the Fall of the year so abundantly on all kinds of trees and shrubs—as every entomologist in the habit of "beating" is aware—that it was named in consequence of this wandering habit. I have reason to believe that in *Pemphigus* as in *Phylloxera*, the winged females give birth in the Autumn, after leaving their galls, to wingless sexual individuals whose issue must naturally perish on all trees except Cottonwoods.

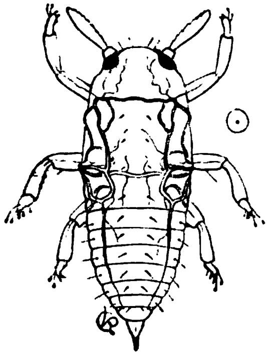
The particular part of the vine chosen by these winged mothers, when they settle in a vineyard, for the deposition of their eggs, has not yet been definitely ascertained. "In confinement I have had such eggs deposited both on the leaves and on the buds, and from the preference which, in ovipositing, these aerial mothers showed for little balls of cotton placed in the corners of their cages, I infer that the more tomentose portions of the vine, such as the bud, or the base of a leaf-stem, furnish the most appropriate and desirable *nidi*. On this hypothesis it is quite possible for the insect to be introduced from vineyard to vineyard, or from country to country, as well upon cuttings as upon roots."—[6th Rep. p. 46. So I wrote a year ago; but while these eggs may frequently be laid upon the vine itself, I am now disposed to believe that they are more often laid in the minute cracks and interstices on the surface of the ground, especially near the base of the vine; for where I have had the females confined in tubes or bottles half filled with moist earth, they have often deposited in the interstices at the sides of the vessel, and, as Balbiani has remarked, the constant elongation of the abdomen, and tentative motion of the tip from side to side, which is common to these winged mothers, rather indicate search for some such positions.

THE SEXUAL INDIVIDUALS.

We have seen that the winged females abound, especially during August, and that they deliver themselves freely of their egg-like contents. They are quite active during the warmer parts of the day and are comparatively short-lived, at least in confinement, where they usually die along side their eggs. These eggs are twice as long as wide, the larger ones, which produce females, about 0.025 inch and the smaller 0.018 inch long. They are quite pale and translucent and soon begin to show the reddish eyes of the embryon within. They hatch, however, with great difficulty in confinement; and though I have had several hundreds under my care at one and the same time, in tubes and in jars, with and without moist earth, yet I have succeeded in getting but two females to hatch; though many of them if mounted in balsam before life departs and they become discolored, will show the characters of the enclosed animal with tolerable distinctness. Balbiani found the same difficulty in hatching these sexual eggs from the winged females; but had better luck with those from the wingless underground individuals, which seemed to hatch more readily.

These sexual individuals are, as already stated, entirely destitute of mouth-parts, and have simply, in their stead, a little tubercle where the proboscis of the other individuals originates. The male is readily distinguished by the penis which extends from the tip of the abdomen, and is bulbous at base, but terminates in a sharp point. The female is distinguished by the pedunculated third joint of her antennæ, but except in these striking characters, they bear a close resemblance to the ordinary larva. I introduce in illustration of the male, a dorsal figure of the male of a larger species (probably *caryæcaulis* Fitch*) the mounted specimen of which is a better subject to figure than those from *vastatrix;* and in connection with the ventral view given further on of the male of the American Oak Phylloxera, will convey a sufficiently exact impression.

[Fig. 19.]



Male Phylloxera: the dot within circle showing natural size.

INJURY DONE DURING THE YEAR IN AMERICA.

The Phylloxera was less numerous and did less injury in 1874 than in any of the three previous years. This was owing principally to the fact that there was a good deal of wet weather in the Spring, though it was unusually dry in most parts of the State later in the season. The grape crop was unusually good, the character of the wine also superior. Yet, notwithstanding the excellence of the average crop of the

---

* This was obtained from some large winged females, beaten, the latter part of September, from some small Post Oaks. From a comparison with the described N. A. species, I take it to be the *Ph. caryæcaulis* Fitch, which forms galls on the petiole of the leaf of the *Carya glabra* (see Synopsis, further on). The winged ♀ is more than twice as large as *vastatrix*, with much blacker mesothoracic band, duskier shades on the head, and duskier wings and members. The male is quite pale in color, 0.02 inch long, with the claws and digituli rather small; but agreeing very closely in structure with the male of *Rileyi*, except in the conspicuousness of the nerves which show through the transparent skin in the manner indicated in the figure,

State—notwithstanding the fact that the Catawba and many other of the more susceptible vines did better than usual; the injury from Phylloxera was often quite apparent in the Fall, and I know of a four-year old Gœthe vineyard in St. Louis county which gave great promise a year ago but which had about succumbed in September; half the vines being at the point of death, and most of them showing the acute symptoms, with the finer roots all wasted away and the larger ones covered with the lice, as completely as is usual with European vines. Such facts serve to show that the insect is by no means destroyed even where, as in 1874, it is with difficulty found in early Spring. Here, therefore, let me reiterate, what cannot too often be repeated, that while only very careful search will detect the insect at the awakening of Spring, and its presence is best indicated by the swollen and rotting roots wherever it has been at work; yet it multiplies so rapidly that in midsummer and Autumn a casual examination will generally reveal it in great numbers on infested vines. I wish to impress this fact for the simple reason that in several instances where correspondents reported no trace of Phylloxera on their vines last Spring, I subsequently showed them abundant evidence of its presence, evidence which at once dispelled their skepticism. While my observations were confined for the most part to our own State, and more especially to St. Louis county, the following valuable letter of experience will show that intelligent grape-growers are recognizing its work in other States:

> MY DEAR SIR: I beg you will pardon my tardy acknowledgment of your polite attention in sending me your very interesting, and, I may say, almost exhaustive report upon the Grape Phylloxera. Although I have been, in a casual way, observing the leaf-infesting form of this Aphid since 1861, I find much that is new to me in your paper; but I am obliged to say, so far as my observations have extended, that they accord almost identically with yours. I did not then even suspect the presence of the root-louse; not indeed until I had seen some account of your investigations. * * * From the increase of its insect-enemies, or from some other cause, the gall-louse has entirely disappeared from this section, and vines formerly infested are now wholly exempt. I wish I could say as much for the root-louse. I hardly think the latter increasing, but he certainly seems to "hold his own." I have one vine, a seedling from Concord, which I call "Lady," a white variety, which, so far, has been entirely exempt from its attacks. From its parentage, I should expect it successfully to resist serious injury, but not to enjoy exemption. Either from some native hardiness, or because it is not entirely to its taste, I have found Concord not injured much even when infested, and only the small, fibrous roots attacked. To a considerable extent, Hartford, Ives, Telegraph, and this class of vines seem able to resist and overcome the attacks of the root-louse, when the various kinds known as "hybrids" succumb, as well as Iona, Catawba, and others of that class. I am well satisfied this root-louse is the most serious of all the enemies the grape-grower has to contend with, and I believe it has been the cause of many failures which seemed unaccountable. As a matter of curiosity, I will send you copy of a letter to the *N. Y. Tribune* in 1863.
>
> Truly yours,
>
> GEO. W. CAMPBELL.
>
> DELAWARE, OHIO, December 23, 1874.

The letter to the *N. Y. Tribune*, referred to by Mr. Campbell, and written in 1863, gives an interesting account of the gall-inhabiting type, and its effect on the leaves.

In addition to the foregoing in illustration of the insect's injuries in America even during a most favorable year for vine growth, our horticultural literature has given further evidence of the same character. Mr. F. R. Elliott, for instance, one of our most prominent horticultural writers, and ex-Secretary of the American Pomological Society, has had much to say during the year about the acknowledged feebleness and failure of many varieties, and among them the Eumelan, Wilder, Catawba and Isabella. But he attributes the trouble to injudicious methods of propagation, and lays the blame to the door of the nurserymen, who, he asserts, in their avidity for gain, have sent out wood that was immature and lacked vitality. His ideas have been very generally, and, I think, successfully repudiated; and, in fact, his argument ought to apply to all varieties—those which succeed as well as those which fail; and while in some few instances there may be foundation for them, I cannot help thinking that the work of Phylloxera has had much more to do with the general feebleness and failure of such varieties.

It must not be forgotten that the character of the soil has very much to do in furthering or impeding the injury from Phylloxera, and that the successful growth of susceptible varieties—as of the Delaware around Warrensburg—may often be accounted for by the sandy nature of the soil; for the insect cannot multiply in such a soil, to the extent it can in one less yielding and more apt to form fissures, crevices and passage-ways.*

RANGE OF THE INSECT IN AMERICA.

Under this head, after showing that the insect is indigenous to the United States east of the Rocky Mountains, I wrote, last year, as follows: "I have myself found it in Kansas, Iowa, Illinois, Missouri, Michigan, Ontario, New York, New Jersey, Pennsylvania and Maryland, and have good evidence of its occurrence in Connecticut, District of Columbia, North Carolina, Texas, and as far south as Florida. It doubtless occurs in all the intermediate States." Its occurrence in Connecticut can now be affirmed; for I found it around Hartford, and upon being informed by Mr. H. T. Bassett, of Waterbury, that he had certain vines which were sickly, I repaired thither with him, and the very first roots obtained revealed the enemy and its work. Yet it certainty does not occur in many parts of Georgia and South Carolina, as is plainly indicated by the following letters which I give entire, because they show how thorough were the observations, and describe the character of the soils in which said observations were made. Yet I have such faith in the general distribution of the insect in the country east of the Rocky Mountains that I fully expect that it will yet be found even in Georgia and South Carolina; and I half suspect that the failure of Messrs. Ravenel and Berckmans to find it, is owing perhaps more to an exceptional season, unfavorable to its development, than to its non-existence there. However, suspecting is not knowing, and here are the facts, as they are given:

---

* As bearing on this point, in addition to what I have said in previous years, Mr. Chas. Teubner, of Hermann, who, in a communication read at the last annual meeting of our State Horticultural Society, reports most grapes as doing well, and insects less injurious than usual, remarks that "in locations where the soil was sandy, grapes did best in every respect, and it is my opinion that to use sand freely in a vineyard (where it can be got) will materially aid in diminishing disease, and bringing the vines into a flourishing condition."

Dear Sir: I am in receipt of yours of 25th inst., requesting me to give you the result of my various examinations for Phylloxera.

Having been appointed by the American Pomological Society at the Boston meeting last year, one of a committee to examine and report in regard to the matter, I have made this season as careful and comprehensive an examination as I could well do. What I had to say on the subject has been already sent on to one of the committee to be embodied in the report. As it consists simply of the results of my examination, a statement of the facts which came under my observation, I will very cheerfully repeat them here. I confess to a surprise at not finding a Phylloxera, but yet I feel perfectly satisfied that my examinations were as careful and thorough as it was possible. I offer no opinion, but give simply a statement of facts taken from my notes made at the time.

June 15, 1874—Examined to-day 4 Isabella and 1 Black July vine, and also 1 Warren, (Herbemont,) in my garden; all old vines. I could find no trace of insect life, neither eggs nor young lice upon the young rootlets, nor the effects of former ravages on the older roots.

June 17, 1874—Examined the following in vineyard of Rev. T. H. Cornish, and with his assistance, viz.: 5 Chasselas de Fontainbleaux, 1 Muscat of Alexandria, 2 Catawba, 1 Pauline and 1 Isabella.

These vines are from twelve to fifteen years old, generally quite healthy and the fruit, up to a few days ago, free of rot; now more rot on the Warren. No trace of insect life on the young, or on older roots, or on any of them.

July 24, 1874—Examined 2 Isabella and 1 Warren in my own garden; and in Mr. Cornish's vineyard, 1 Chasselas, 1 Muscat of Alexandria, 1 Catawba and 3 Warren. Found nothing.

Aug. 22, 1874—Examined 2 Isabellas in my own garden; found nothing.

Sept. 9, 1874—Went over to Mr. Berckmans' *Fruitland Nursery*, near Augusta, Georgia, and made an examination of vines in various parts of his grounds, of several different varieties and under different modes of cultivation. I had the benefit of Mr. de Hardy's assistance in all my examinations, as he had seen the Phylloxera in France and was familiar with its appearance, and the effects of its ravages. In each case the whole vine was dug up carefully and the roots subjected to a close and scrutinizing examination. We found no trace whatever of the insects, nor the effect of any ravages in previous years upon the older roots. We took specimens from 7 different vineyards, some under cultivation and others thrown out for a year or two.

1 Israella, 7 years old, uncultivated for one year.
1 Clinton, 12 years old, uncultivated for one year.
1 Clinton, 3 years old, under cultivation.
1 Catawba, 15 years old, out of cultivation two years.
1 Golden Clinton, 4 years old,
1 Concord, 3 years old,
1 Wilder, 3 years old,
1 Northern Muscatine, 3 years old,
1 White Riesling, 3 years old,
} Under cultivation.
1 Taylor, 4 years old, cultivated.
1 Alvey, 6 years old, uncultivated for one year.

The above is simply a transcript from my notes, and is at your disposal. I feel satisfied that had the Phylloxera been present, it could not have escaped my observations, and I can safely say, that it was *not infesting* the vines which came under my examination.

Very truly yours, H. W. RAVENEL.

AIKEN, S. C., November 30, 1874.

In yours of the 5th inst., received yesterday, you inquire about the character of the soils in which I examined grape vines. There were three localities:

First. My own lot in Aiken, into which I moved a year ago, and found there vines growing. This is a light (extremely light) sandy soil, clay from eight to ten feet beneath. We are just on the border of the "Sandhill" region, a belt of four sand hills, running about 100 miles parallel with the sea coast, about ten to fifteen miles wide, and extending from North Carolina, through South Carolina into Georgia.

Second. Rev. Mr. Cornish's vineyard has more clay, but could not be called a clay soil, perhaps only a good admixture.

Third. Berckmans' "Fruitland," four miles west of Augusta, is a red, or rather brownish soil, with just clay enough to make a freable loam, made darker of course by manurings, and containing a vast quantity of rounded pebbles, intermixed, from one to two or three inches in diameter. I think that these three soils represent the soils most commonly in cultivation. * * *

Yours, cordially, H. W. RAVENEL.

AIKEN, S. C., December 11, 1874.

DEAR SIR: I am glad Mr. Ravenel gave you a detailed account of his observations. Last September he spent some days with me, and we visited several localities, and carefully investigated many vines from 1 to 15 years old. Since then I have examined vines in Atlanta, some 15 varieties, Æstivales and Labruscas, but no signs of Phylloxera. Soil there quite compact; a clayey loam. On my place the soil is of mixed character. The whole tract is underlaid with a red clay subsoil, except in my low lands, which are alluvial. A portion, 300 acres, is what is termed here "Mulatto land," a rich loam of about 18 to 24 inches deep. Another portion is mixed with gravel and red clay subsoil, and a small portion is more sandy. All my land is what is called here red land, in contradistinction to the sandy region, which is called grey land. One mile from my house is a creek. On my side the subsoil is red clay; on the opposite it is white clay and sand, and a little higher up on the ridge no clay whatever is found, even to a depth of 200 feet, as was shown where a well was sunk of that depth. In making our observations last Summer in every variety of soil of this region, I have kept a memorandum of each variety examined, and the class of soil wherein it was planted. From your statements I anticipated fully to find the insect, but so far I am safe in saying that your predictions as to our section being infected with the Phylloxera is, happily for us, not fulfilled so far.

Yours truly,
P. J. BERCKMANS.

AUGUSTA, GA., Dec. 10, 1874.

Regarding its introduction into California around Sonoma, Mr. G. L. Wratten wrote, under date of July 9, 1874, that he is quite sure they have it, but that the grape-growers there are quite excited about the matter, and wish to hush the fact.

INJURY DONE DURING THE YEAR IN FRANCE.

So much of the wealth and prosperity of France depends on her grape crop, and the result of the grape harvest is looked forward to with so much anxiety, that the Phylloxera continues to occupy the lively attention of that nation. The investigators have been active and numerous, and each week this little insect occupies no inconsiderable portion of the time of the French Academy. The government has increased the amount of the reward for a simple, available remedy, from sixty thousand to three hundred thousand francs; while several societies have offered minor sums for the same purpose, and to enable the proper experiments and observations to be carried on.

The decrease which the Phylloxera had caused in the grape product for the past few years has, however, been made up by an excellent average yield in 1874. Notwithstanding injurious late frosts, a severe hail storm and the Phylloxera in some of the southern departments, the yield in the country at large, both in quantity and quality, has been above the average, and her 2,000,000 hectares (nearly five million acres) of vines, giving employment to 7,000,000 laborers, produced, according to the *Economiste Francais,* as much as 70,000,000 hectolitres (over 1,850,000,000 gallons) of wine. Indeed, the vintage was so unusually good in the non-infested districts, that there was an insufficiency of casks; while in some of the ravaged districts it was so poor that the wine makers were glad to sell their casks, for which they had no use, to their more fortunate countrymen.

M. L. Bazille, of Montpellier, in a recent letter says:

> The Phylloxera continues to commit great ravages in our vineyards. We are on the eve of losing them entirely. Those who can submerge do so and with success. They are convinced of its beneficial effects. The efforts and sacrifices made to organize and employ this method attest its value. Several persons have built large engines to elevate the water, and others have been at very large expense to obtain and control water. But it is only the few who can afford such outlays, and the mass of our grape-growers, in view of the poor success attending other remedies, fall back on the use of American vines, through which they hope to be relieved of embarrassment.

SPREAD OF PHYLLOXERA IN EUROPE.

It would be out of place in this report to give a detailed account of the spread of the insect in Europe, and it suffices to say that it continues to widen its territory in France, and that several neighboring European governments have taken stringent measures to prevent the importation of vines from the infested districts of Europe and from America. Just as its presence at Klosterneuburg, near Vienna, Austria, discovered in 1872, was easily traced to American vines which had been introduced there; or as its appearance in Portugal during the same year was referable to the same cause; so at each new point where it has been discovered, its presence has been easily explained, either by gradual spreading from infested districts or by importation on infested vines. Thus its discovery during the year at Pregny, near Geneva, Switzerland, seemed at first to baffle explanation. The fatalists contended that it must have passed from Lyons, France—the nearest infested region—and declared that it was useless to contend against an enemy which could pass over a hundred miles in a season. M. Dumas, perpetual Secretary of the French Academy, conceiving the importance of having the problem studied and elucidated, commissioned Max. Cornu to make the proper investigations, the result of which was to prove that the only way in which the insect passed the Jura and reached Pregny without leaving its tracks on the way, was by rail, and carefully packed in boxes. In fact it was traced to a grapery belonging to Baron Rothschild, in which were cultivated a number of varieties, and, among others, some obtained from an English grapery, and received as young plants in pots. The insect has for many years existed in graperies in England and Ireland, and the particular vines in question were found to be badly infested. All the infested vines have been condemned to destruction by the Swiss Government.

The insect has, also, recently been found in small quantities on American vines at Bonn, in Prussia, and the German Government has prohibited the importation of American vines.*

DIRECT REMEDIES.

There is little to add to what was said on this subject in my last report. Very elaborate experiments have been carried on in France and as elaborately recorded; yet the fact remains that, as we have already seen, submersion, from the practical standpoint, is the only remedy which is being extensively employed. The use of sand, especially when mixed with cinders and guano is highly spoken of, and the methods of invigorating the vine by fertilizers rich in potassic salts continue to gain in favor. M. Mouillefert, who has experimented at Cognac with sulpho-carbonate of potassium—generating and conveying it in different ways—and M. Balbiani, who has persevered at Montpellier in the use of coal tar, have proved that both these substances may be employed with good effect to destroy the Phylloxera; but it remains to be seen whether their methods will fulfill the requirements by coming into general use. The sulpho-carbonate, which was employed at the suggestion of M. Dumas, is placed at the rate of four ounces in a hole at the foot of a vine. By decomposition the sulphuret of carbon, spoken of last year, is generated and kills the lice without affecting the vine. The instrument used for introducing the liquids intended to generate the destructive gases, is an augur with a hollow shank, perforated just above the cutting portions. The liquid is poured into the hollow portion of the augur from above the handles.

---

* Since this was written, I have received the following note from Dr. G. Blankenhorn, of Carlsruhe, referring to the discovery of the insect in other localities:

Your excellent work on the Phylloxera I have copied in my "Annalen der Œnologie," and it has done much to help us in Germany to understand this insect. The subject grows more and more important for us Germans since our viticulture is threatened. You probably have already read that it has been discovered during the last few weeks in three different localities in Germany, (in Annaberg, by Kornike and Kreusler; in Carlsruhe, by myself and D. Moritz, and in Worms), and without exception only upon American grape-vines."

NATURAL ENEMIES.

It appears pretty certain that the mite I described last year as preying on Phylloxera, is likewise found in Europe; or at least a species that cannot well be distinguished from it. Thus during the year, M. A. Fumouze, an authority on these minute animals, has published some notes showing that he has found this same Tyroglyph on roots affected with Phylloxera in France, and that it is apparently the *T. echinopus* described by himself and Ch. Robin in the *Journal de l' Anatomie et de la Physiologie*, in 1868. Prof. L. Rœsler, of Klosterneuburg, Austria, also announced to me by letter that he has found and studied both the Phylloxera Mite and the Mussel-shaped Mite (*Hoplophora arctata*) on the infested vines of that place. He has also observed, in addition, the larva of a Lace-wing (*Chrysopa*) and the Myriapodous *Pollyxerus cagurus* preying on Phylloxera underground.

In addition to the Weeping Lace-wing mentioned last year, I have this year reared the Consumptive Lace-wing (*Chrysopa tabida* Fitch) from larvæ preying on the gall-lice.

In reference to the heteramorphism of these mites M. Méguin states* that *Hypopus*, *Homopus* and *Trichodactylus* are but heteromorphous pupæ of different species of Sarcoptides, and among them of *Tyroglyphus*. He proves that, as Claparède observed in the aquatic *Atax*, a new individual is formed under each skin, and all the parts are developed anew, and not simply drawn out of their old envelopes, as was formerly supposed.

SUSCEPTIBILITY OF DIFFERENT VARIETIES.

In addition to that already published under this head, I have simply to add that M. Eugene Morel, of Ridgeway, N. C., sent me last August leaves of the Scuppernong (*Vulpina*) covered with the Phylloxera galls, so that this species can no longer be considered exempt from the attacks of the gall-making type, though the more injurious root-inhabiting type has not yet been found upon it. The "Telegraph" should be taken from the list of Summer grapes (*æstivalis*) and placed with the Northern Fox (*Labrusca*); and the Delaware should be removed from *Riparia*, also to Labrusca. Though the exact position of the Delaware in the classification of the genus *Vitis* has been a mooted question, and some have even supposed it had a European origin; yet those who have most studied the subject now concur in the opinion, years ago expressed by Fuller in his *Grape Culturist*, that it belongs to *Labrusca*—an opinion substantiated by the facts that its seedlings almost invariably show true, undoubted Labruscan characters, and that other undoubted varieties of Labrusca (as Shepherd's Delaware, raised from seed of Catawba) bear a similar pale fruit and delicate leaf, and otherwise very closely resemble it. The seed characters bear out this opinion, though they also indicate that the variety may contain a slight strain of the European *vinifera*. It is not improbable, therefore, that the Delaware owes its characters to hybridization, by insect agency, between *Labrusca* and *vinifera* (the Labrusca strain predominating), and this view would be greatly strengthened if it could be proved—as was doubtless the case—that European vines were cultivated at Frenchtown, N. J., where Mr. Prevost first found the Delaware. This origin and nature of the Delaware, by the way, throws a flood of light on its susceptibility to Phylloxera.

---

* *Comptes Rendus de l' Ac. des Sc.*, Paris June 8, 1878.

The nature of the "Jaques," which successfully resists Phylloxera in the vineyards of Mr. Laliman at Bordeaux, in France, and of which I have stated (Fifth Rep. p. 66,) "I do not know this variety unless it be a synonym of the Ohio," has been fully discussed by Prof. Planchon,* and by Mr. Bush in his new Descriptive Catalouge.† I reproduce what is said of it in this last little work, which is a most valuable manual, and reflects great credit on the firm that issues it. From this extract it will be seen that Mr. Bush is strongly inclined to the opinion that the vine so prized in France, under the name of Jacques, is in reality the Lenoir.

OHIO. Syn. SEGAR-BOX, LONGWORTH'S OHIO, BLACK-SPANISH ALABAMA; is now understood to be identical with the "Jaques" or "Jack," introduced and cultivated near Natchez, Mississippi, by an old Spaniard of the name of Jaques. It used to be grown in Ohio, where the stock originated from a few cuttings left in a segar box, by some unknown person, at the residence of Mr. Longworth, of Cincinnati, Ohio. * * *. Downing (Fruit and F. trees of Am.) said "it is most likely a foreign sort, and except in a few localities, a *sandy soil* and a mild climate, it is not likely to succeed." But Geo. W. Campbell, whom we have to thank for valuable information on this and many other varieties, says: "I always considered the Ohio or Segar-Box, from its fruit, habit of growth and foliage, as of the same family as Herbemont, *Lenoir*, Elsinburgh, and that class of small, black, southern grapes." * * *. A few vines sent years ago, under the names of "Jaques" or "Ohio," to France, by P. J. Berckmans, of Georgia, proved very fine and valuable, perfectly resisting Phylloxera, having remained healthy in the midst of vineyards destroyed by the root louse. This attracted great attention and gave importance to this variety. But when Mr. Berckmans was asked for more of these vines, he stated that he had none, and that their culture had been entirely abandoned. The above descriptions by our most experienced and reliable horticulturists, make it more than doubtful whether the vines, succeeding so well in the vineyards of Mr. Borty, at Roquemare, and of Mr. Laliman, near Bordeaux, are the "Ohio" or "Jaques." After considerable research, we find that Mr. G. Onderdonk, the pioneer fruit-grower of Western Texas, describes the *Lenoir* (original stock of which he had obtained from Berckmans) as follows: "*Bunches* large, long, loose; *berries* small, black, round; no pulp; vinous and much coloring matter; leaves lobed; a fine bearer and wine grape. And we would add that the leaf and habit exactly resemble those of the *Black Spanish*. We have never planted a variety that grew off better than this variety has done during the two years we have had it in cultivation. In 1873 we gathered fruit from this variety that had been ripe seventy days on the vine." From these facts we strongly incline to believe that *this Lenoir* is the variety our friends in France are looking for, and have received under the name of Jaques.

---

* *Les Vignes Americaines; leur Culture; leur Résistance au Phylloxera*, Paris, 1875.

† Bushberg Illustrated Catalogue, 1875.

GRAFTING AS A MEANS OF COUNTERACTING THE WORK OF PHYLLOXERA.

The advantages of grafting are two well recognized to need enforcing. By its means, healthy, vigorous vines, which do not fruit well, may soon be made abundant bearers; new varieties and seedlings be quickly tested, and a less desirable variety replaced by one more desirable. Our knowledge of the Grape Phylloxera has of late pointed out other cogent advantages that may be derived from grafting, and it is in view of the renewed interest which I have found manifested in it among grape growers, that I venture a few remarks on a subject with which I have had little personal experience, but to which I have given some attention through observation and study of the experience of others.

Having shown that certain varieties of our grape vines have a far greater power of resisting the Phylloxera than have others, and that they represent all degrees of susceptibility, from those which invariably succumb in the course of two or three years, to those which are seldom affected, and never materially; I took occasion to urge judicious grafting as one of the most available means of coping with the disease; and also to request of those grape-growers who have the advancement of their calling at heart, and who are so circumstanced that they can make the trials, to institute experiments in grafting some of the most susceptible varieties. (See Rep. 6, pp 49, and 78–81.) As the report mentioned was not distributed till it was too late in the year for my request to be complied with, and as only the few of whom I made the request, through other means, have begun to carry out the suggestion, I take this opportunity of renewing it, and of offering a few remarks for guidance.

One important fact should always be borne in mind in this connection, and that is, that the Grape vine, having a very thin inner bark or liber, does not graft with the same ease as do the more common of our fruit trees, such as apple, pear, etc.: more care is, therefore, necessary in the operation.

Cleft grafting is the more ordinary mode employed, and it is usually done by digging away the earth, and inserting the graft very early in the Spring, two or three inches, or at the first smooth place below the surface. A horizontal cut of the stock is generally made, but a sloping one is, perhaps, preferable, from the fact that it enables all the gummy matter and excessive moisture which oozes from the cut, to run down, and not accumulate to the injury of the cion. Fuller recommends grafting in the Fall, and while this method is not deemed so advisable in Missouri, where there is such continued alternation of freezing and thawing, which is apt to lift the cion and separate it from the stock; yet I give his method in his own words, as recently published in the New York *Tribune:*

> Select cions of the present year's growth, and from canes a quarter to three-eighths of an inch in diameter, and cut into lengths of three inches, with a bud near the upper end. The lower end should be made into a long, slender wedge. Remove the earth about the stock four to six inches, if the main branching roots will permit of this depth. Then cut off the vine a few inches below the surface and square across; then split it with a chisel or knife, making as smooth a cleft as possible for the reception of the wedge-shaped cion. If the stock is an inch or more in diameter, two cions may be needed, one on each side of the cleft.
>
> The outer edge of the wood of the cion should be placed even with the outer edge of the wood of the stock, no attention being paid to the uniting of the two, because one will be very thick and the other thin. A nice fit of the two is essential, and in crooked-grained, gnarly stocks, a smooth, even cleft can only be made by cutting out the wood with a sharp instrument. But it does not matter how it is done if it is well done. After fitting the cions to stock, wind a strong cord about the two, in order to hold the former firm in place; then pack grafting clay or common soil about the stock, entirely covering the wound made and the lower half of the cion, but leaving the bud uncovered. No grafting wax should be employed in grafting grape vines. After the cions have been inserted as directed, invert a flower-pot or small box over the cion; upon this place a quantity of leaves, straw or hay; then cover all with earth, rounding it up in order to keep the water from settling around the grafted stock as well as to prevent too severe freezing.
>
> Early in Spring remove the covering, and if the operation has been properly performed, the cion will be firmly united, and will push into growth as the season advances. I have had Delaware, Iona and similar varieties make a growth of from forty to sixty feet of vine from a single bud in one season, set in strong stocks in the manner described. Grafting in the Spring may be performed in the same manner, omitting the covering, but it should be done very early or after the leaves have started and growth begun. The cions, however, should be cut early and kept dormant in some cool place until wanted for use.

But valuable above all other experience for our own people, will be that of Mr. George Husmann, and as he has said little on the subject in his well known work, "Grapes and Wine," I take pleasure in giving that experience, as he has kindly communicated it to me:

> DEAR SIR: As you wished to have my views of grafting the vine, especially with the object of grafting some of our varieties most subject to the ravages of the Phylloxera upon roots of varieties which resist it, I will cheerfully add my mite to the researches which have already thrown so much light upon the history and the failure of so many of our otherwise most valuable varieties. My first attempt at grafting the vine were made in the Spring of 1852, nearly twenty-three years since, and were made by grafting the then rare varieties of Norton's Virginia and Herbemont upon five years old Isabella roots. I found in the first edition of A. J. Downing's "Fruits and Fruit Trees of America," a few remarks on the practicability of grafting the grape below the ground, which led me, then a novice in horticulture, to try it, and with eminent suc-

cess. I took the ground away from the crown of the vine until I came to a smooth place, then cut off the stock, split it with a grafting chisel and inserted from one to two cions, according to size of stock, cut to a long wedge with shoulders on each side. I used no bandages, as the stocks were strong enough to hold the cions firmly, and only pressed moist earth on the cut to cover the wound. This was done on the 22d and 23d of March, and the cion covered and shaded to the top bud. About three-fourths of the grafts grew vigorously and fruited the next year. They have produced heavy crops ever since, and when at Hermann, a week ago, I still found them vigorous and healthy, while the Catawbas around them have "passed away" several years ago. I have practiced various methods since, with more or less success, and still think this the best and most practicable, though it is neither an easy nor a pleasant task, as it must be performed when the ground is still cold and moist, and requires a good deal of stooping. The inner bark or liber of the vine is very thin, while the outer bark is very thick on a large old stock. The success of the operation depends entirely on a good junction of the liber of stock and cion, and therefore requires a steady hand and a good eye to push the cion to its place. My friends, the venerable Fr. Muench and Samuel Miller, practice about the same method, and are both almost invariably successful. The cions should, if possible, be cut in Fall and kept on the north side of a building or fence, so as to remain dormant. Should the stock not be strong enough to hold the cion firmly, it should be tied with basswood bark, or an oblique cut be made instead of a split. This is preferable in small vines any way, as by so doing, the fibres of stock and cions are both cut obliquely, and therefore make a closer fit.

There are other different methods. Another, which I will mention here, has been practiced at Hermann with very good success, though I have not been very successful with it. It has the advantage of saving the vine, provided the graft does not take. It is done by simply making an oblique cut into the stock below the surface or crown, and inserting the cion, cut to a rather blunt wedge, by bending the stock to one side, and thereby opening the cut. If the cion takes, the stock is cut off above it. Another method is grafting under the bark later in the season, when the sap flows freely and the bark peels readily; a long, slanting cut is made on one side of the cion, the stock cut off square, the bark lifted with a knife, and the cion pushed down under it. Every one who has practiced budding will readily perform this operation. The stock is then tied with basswood bark. I have followed this plan with varied success later in the season, but prefer the first method. I think grafting above ground impracticable in our climate, on account of the high winds and drying influence of our Summer sun.

As to the advantages to be gained by grafting, they are manifold. They may be summed up as follows:

1. The facility it gives us to try and fruit new and rare kinds by grafting them on strong stocks of healthy varieties, where they will often make wood strong enough for fruiting the next season, and give us abundance of propagating wood, thus gaining more than a year.

2. Nearly every vineyard contains some worthless varieties, which are, however, strong and healthy growers. These can, by grafting, be changed into the most valuable varieties.

3. The facility by which varieties which are very difficult to propagate may be increased and multiplied, as nearly every variety will graft readily.

4. Last, but not least, it gives us a means of successfully combating the Phylloxera, as your experiments have so conclusively proven. If the Catawba and many of our other most valuable varieties, have deteriorated because this little insect has been to work on their roots, and the roots of other varieties are comparatively exempt from its ravages, the remedy would indeed be a very simple one. By planting such varieties as propagate readily, and also graft with ease, they could be changed by grafting the second Spring. I know, from experience, that slow growing varieties can be made to grow much more vigorously by grafting on stocks of strong and healthy growers. The most vigorous and productive Delaware I know around Hermann, was grafted on a Norton's Virginia, and produced an abundance of fine fruit, when Delawares on their own roots, in the same vineyard, dropped their leaves, and did not ripen their fruit. It is certainly of the utmost importance that experiments of this kind should be made, and I would advise all lovers of the Catawba and Delaware to try it.

But now the question arises, what stock shall we choose? The Clinton, though easy of growth, is a poor stock, as it suckers inveterately, and, besides, has not the affinity to most of our valuable varieties which makes them take readily on it. In fact, I do not consider any of the Riparia or Cordifolia class as good stocks, for Labrusca and its hybrids, or Æstivalis. But the Concord seems to me eminently the stock to graft upon. Easy of propagation, within the reach of every one, with the adaptability to any soil it possesses, and as nearly every variety will unite readily with it, it seems as if hardly a better one could be found. But were I to plant it for this purpose, I would take good, strong plants, say at least one foot long from the cutting to the crown, plant them with their roots one foot below the surface, and trim off the surface roots clean, only leaving the roots on the two lower joints. Then cultivate well for one year, and graft as near the surface as practicable to insure the life of the cion. Should the plants make roots above the junction, I would cut them smoothly close to the graft every Spring, and thus establish the plant entirely upon Concord roots.

This may seem very troublesome to our friends who plant vineyards entirely upon the easy plan, and let them take care of themselves. But I think that their days are numbered. This slovenly culture, or rather no culture at all, will never make us a wine producing country worthy of the name; and if we had not a single one of that stamp left among us, I believe we would be infinitely better off than we are now. If France can import millions over millions of our American varieties to regenerate her devastated vineyards, we can certainly afford to use the means ready at hand. Our American wines have a glorious future, and we have the material for the grandest results already. Last August I sent two boxes of assorted wines, fifteen varieties, made by Messrs. Poeschel & Scherer, at Hermann, to my French correspondent, Messrs. Douysset Fils, at Montpellier. I quote from a letter just received, the following: "We have duly received the wines of Mr. Husmann, and they were exhibited by us before the International Congress of Viticulture, just held at Montpellier, and tested by a committee of thirty members, officially appointed for that purpose. They were about the best connoisseurs of France. Norton's Virginia and Cynthiana, as red wines, Martha, Gœthe, and above all, Hermann and Rulander, as white wines, were highly praised; and the general opinion is, that after we have restocked our vineyards with American vines, we will not regret the loss of our own very much. As to Concord, Ives, Wilder, North Carolina. Clinton, Herbemont and Cunningham, they will very likely be generally planted in our black soils, and much used for stocks for our Aramons."

This was accompanied by an order for a million of Concord and all the Herbemont cuttings I could yet secure, as well as smaller orders for other varieties. When our products are thus appreciated in the greatest wine producing country we should throw sloth and sluggishness aside and go to work in good earnest and with all available means. Let none follow or commence grape growing in the future who are not willing to do their best. We want brains and skill, as well as muscle. We want close observation, indefatigable exertion and intelligent labor in the vineyard as well as in the wine cellar. It is my belief that the darkest days of American grape culture are over, and that the future will not fail to bring us glorious results if we labor for it faithfully.

Your labors have done a great deal to post us in regard to our insect enemies and friends, and should be gratefully appreciated by every grape grower, while all should do their part in sending you specimens and observing their habits.

GEO. HUSMANN.

SEDALIA, Mo., December 20, 1874.

It will be noticed that the above experience and directions refer solely to grafting underground. Both Fuller and Husmann deem grafting above ground impracticable in our climate, principally on account of our winds; and their advice has been so very generally followed that little attention has been given to this mode of grafting the grape vine. The consequence is that we have the most conflicting experience as to the results of grafting; for, by the underground methods, the graft will make its own roots in the course of a few years, unless very great pains are taken to prevent such an occurrence; that it has done so in the majority of cases of grafting in this country in the past, admits, I think, of little doubt. Yet, in grafting as a means of counteracting the Phylloxera, the first requisite is to prevent the graft from making any roots of its own; for it must be remembered that we are dealing with a root malady purely, and that the object is to grow those varieties whose roots succumb more or less to the attacks of the insect, by using the roots of those which resist;

this object is necessarily frustrated in proportion as the graft forms roots of its own.

There are two methods of grafting above ground, which I have every reason to believe may be made more successful than grape growers have hitherto been led to suppose. The first is by temporarily making a false surface and grafting in the ordinary manner just described, *i. e.*, instead of digging away the earth and inserting the cion two or three inches below ground, it should be inserted two or three inches above ground and the earth thrown up around it, to be removed only after the graft is thoroughly and permanently joined. There will then be no danger of the graft forming its own roots; and it is certainly as easy to throw the earth around the vine as to dig it away, while the mechanical work can be much more conveniently and agreeably performed above than beneath the surface. No doubt this mode of grafting needs greater care to make it successful, especially in a very dry season, as the mound is more apt to dry out than the level ground. Yet there is not lacking evidence that this method will work well in our soil and climate. Mr. Jno. Vallet, of New Haven, a grape-grower of much experience, has had eminent success in thus grafting above ground, employing flax twine and paw-paw bark for bandaging. He considers that the vine grows more vigorously and that there is less danger of separating the graft when once formed, as there is no necessity for going below ground to destroy the suckers, the doing of which sometimes loosens the graft.*

The second method is by inarching. This system of grafting does not seem to have been much practiced in this country, yet while it requires great care, and success may not as often crown the effort as in the former methods, I hope more attention will in future be given to it.

The operation is comparatively simple: A slice two or three inches long is cut from one side of the vine to be grafted, and a similar slice from the vine which is to serve as stock, as near the base or butt as possible. The two cut portions are then brought face to face, so as to fit as neatly as possible, and are then bound together with cord, basswood bark or other grafting bandage, which should be kept moist with moss. In the course of a fortnight partial unison takes place, when the bandage should be somewhat loosened to admit the expansion. In six or eight weeks, if the operation is successful, the stock and cion are firmly united, when the bandage may be removed. The graft immediately below the union and the stock immediately above it should then be partially severed, and in a week or so more, entirely cut loose.

---

*Mr. Vallet informs me that in 1861 he grafted above ground for Emile Mallinckrodt, in St. Louis county, a number of Catawbas on Isabella stock; that they did admirably, and subsequently produced from 60 to 80 bunches to each vine. He also, in the same manner, in the years 1862 and 1863, grafted Delaware onto Isabella, 12 miles from St. Louis in Mr. Layton's vineyard on the Olive street plank road. The grafts did splendidly, and subsequently gave fine crops. By contrast to this experience, and interesting from the Phylloxera standpoint, he grafted for Miller & Bates, of New Haven, Virginia Seedling on Catawba, (1500 in 1866 and 1500 in 1867,) and no grapes resulted, only five per cent. of the grafts growing.

While, as already stated, this mode has not been much practiced in America, sufficiently successful results have been obtained to encourage further trial; and, as an example, I will mention one instructive instance communicated by my friend Isidor Bush. One of his customers, Eugene Cambre, of Nauvoo, Ills., has for some time furnished him with a superior quality of Delaware wine; and being anxious to know how Mr. Cambre succeeded so well with the Delaware, when so many others in the same neighborhood failed with it, Mr. Bush inquired as to the reason, and found that it was Mr. Cambre's custom in planting a Delaware vineyard to plant alternately with a Delaware, a wild vine from the woods, and to subsequently transfer the Delaware onto the roots of the wildling, by this system of inarching.

The Delaware, as may be seen by the tabular statement in my last report, is among those which suffer materially from the Phylloxera, and several other cases of its successful growth when grafted onto wild vines, where on its own roots it failed, were elicited at the recent meeting of the Illinois State Horticultural Society, held at Peoria.

Mr. Cambre has very kindly communicated to me his method, but the following description of it, from the Grape Manual of Messrs. Bush & Son & Meissner, so well covers the ground that I give it in full:

> For this method it is desirable that two plants, one each of the variety which is to form the stock, and one of the scion, be planted close together, say about one foot apart. In June, (tne first year, if the plants make a sufficiently strong growth, if not, the second year,) or as soon as the young shoots become sufficiently hard and woody to bear the knife, a shoot is taken from both the stock and the scion vine, and at a convenient place, where they may be brought in contact, a shaving is taken out from each of these, on the side next to the other, for a length of 2 to 3 inches. This must be done with a smooth cut of a sharp knife, a little deeper than the inner bark, so as to obtain on each a flat surface. They are then fitted snugly together, so that the inner bark joins as much as possible, and wrapped securely with some old calico torn in strips, or soft bass strings. Besides this, it is well to place one tie a little below, and one above the grafted point, and also to tie the united canes to a stake or trellis to insure against all chances of loosening by the swaying of the wind. The rapid swelling of the young growth at this period of the year makes it desirable that the grafts be looked over after a few weeks, replacing such ties which may have burst, and loosening others which may bind so as to cut into the wood. A union will generally be made in the course of two or three weeks, which will be further consolidated in the course of 6 to 8 weeks, when the bandages may be removed and the grafted portion left exposed to the sun, to

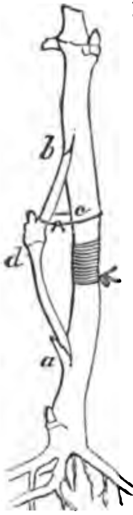
> thoroughly harden and ripen it. The shoots themselves are to be left to grow undisturbed for the rest of the season. In the Fall, if a good union has taken place, the cane forming the scion is cut close *below* its union with the stock cane, which in its turn is cut close *above* the connnection. Supposing the stock to have been a Concord and the scion a Delaware, we now have a vine of the latter entirely on the strong, vigorous root of the former. Of course constant vigilance must be exercised to prevent suckers from starting out of the stock. It is well to protect the grafted joint the first few winters by a slight covering of straw or soil to prevent the frost from splitting it apart.

Mr. Cambre in giving his experience writes: "I have positively abandoned cleft grafting; it is too much trouble and too uncertain, and the graft often makes its own roots. I assure you that from a long experience in inarching, I am of the opinion that not alone the Delaware but most of our cultivated varieties will do better on native wild roots than on their own. I have 14 acres of vines mostly grafted in this manner on wild stocks, and I have not lost one of such grafts. It is preferable to graft at from 10 to 15 inches from the ground."

Another mode of grafting above ground is thus given in "The Cultivation of the Grape," by W. C. Strong:

> In *The Gardeners' Monthly*, Vol. II, p. 347, is a description of a mode practised with success by Mr. Cornelius, which we copy, not merely as it is interesting in itself, but also because it illustrates many other modifications in grafting:

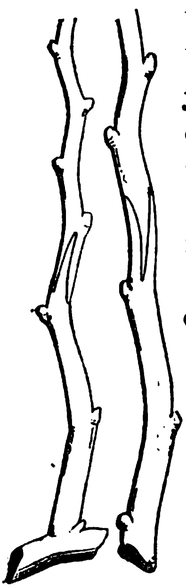
[Fig. 20.]



> "After the first four or five leaves are formed, and the sap is flowing, you choose the place on the vine where you intend to graft. At that point wrap tightly a twine several times around the vine. This will, in a measure, prevent the return sap.
>
> "Below the ligature make a sloping cut down, as shown at Figure 20, *a*; also, a similar reversed one above the ligature, as at *b*, about one inch in length. In selecting a scion prefer one that has naturally a bend. Cut it so that it shall be wedge shaped at both ends, and a little longer than the distance between the cuts in the vine at *a* and *b*. Insert the scion, taking care to have the barks in direct contact, securing it with a string, *c*, bound round both scion and vine sufficiently tight to force the scion ends into their places. If the work is done well, no tie will be required at *a* and *b*, but the joints should be covered with grafting wax. In a short time, the bud at *d* will commence its growth, after which you can by degrees remove all the growing shoots not belonging to the scion, and in course of the Summer you may cut off the wood above *b*, and in the Fall remove all above *a* on the stock, and above *c* on the scion.

Still another mode of grafting which has, I believe, seldom, if ever, been attempted in this part of the country, but which has been employed with much satisfaction the past year by a few vine growers in France, and especially by M. H. Bouschet, of Montpellier, remains to be mentioned. It is the Winter grafting of a cutting of such variety as is desired to grow, upon another which is to be used as stock, the combined cuttings being planted in the usual manner in Spring, leaving only the buds on the graft proper out of ground. This is very similar to our ordinary mode of making apple grafts; and while we have little or no experience in this country on which to base anticipations, the method is worthy of trial, and is illustrated at figure 21.

[Fig. 21.]



But not to weary with details, I here reaffirm my belief, strengthened by each further observation, and by every additional experience of the past year, that just as the working of the root-louse is the primal cause of failure of some of our choicest varieties of the Grape vine, so in judicious grafting we have the most available means of counteracting its work, and of thus growing successfully many of those kinds which cannot be grown in this latitude with any profit or success on their own roots.

The recommendation to use our most resistant varieties as stocks for the French vines in the districts ravaged by the Phylloxera have already been followed by large demands for such varieties by the people of those districts, and while we yet scarcely know how our vines will act under the new conditions in which they are placed, the uncertainty as to the results of judicious grafting here at home, scarcely presents itself, for everything augurs favorably.

I have not, in the foregoing paper, entered into the discussion of the special influence of the graft on the character of the root, and *vice versa;* because I believe that, while the one doubtless does manifest a certain special influence on the other; yet, for practical purposes, we know that it is so slight as hardly to be worth considering in this connection. The influences of the one on the other are almost entirely due to the abundance or lack of nutrition in the root, and present in the graft no other changes than those of greater or less development in the different parts of its growth; and not in the specific character or quality of the fruit. Geo. Gallesio, in his work on the Orange Family, in which he fully considers the influence of grafting, lays stress on these facts.

In conclusion, I again appeal to those of my grape-growing readers who have the opportunity, to make experiments in grafting the more susceptible on to the roots of the more resistant varieties, and, as a guide, I repeat the following list of varieties that it is desirous to test as stocks and as grafts:

ROOTS TO USE AS STOCK.

1. Concord.
2. Clinton.
3. Herbemont.
4. Cunningham.
5. Norton's Virginia.
6. Rentz.
7. Cynthiana.
8. Taylor.

VARIETIES TO GRAFT ON TO ANY OR ALL OF THE ABOVE.

Of First Importance.

1. Catawba.
2. Iona.
3. Delaware.
4. Wilder.
5. Goethe.
6. Any European vine.

Of Secondary Importance.

7. Ives.
8. Hartford Prolific.
9. Maxatawney.

This list is given wholly from the Phylloxera standpoint, and with a view to discover the real influence of the resisting on the nonresisting kinds. There are many grape-growers who will agree with Mr Husmann, who has so high an opinion of the Cynthiana, that to graft even the Catawba upon it would, as he has remarked to me, "appear like sacrilege." Others again will not think the Hartford and Ives, for instance, worth saving, since they do not deem them worth planting. But any of the experiments indicated—no matter what the quality of the fruit—will prove valuable as showing the influence of a root that is proof against Phylloxera on a vine which on its own roots suffers from it. Experience is not wanting to show that several of the susceptible *Labruscas*, and many hybrids with *vinifera* grow with excellent success on the vigorous roots of *æstivalis;* but let us increase the experience on this point in every direction possible. If the reader can make but one or two of these experiments, I shall consider it a favor to have him do so, and inform me precisely as to the number and varieties grafted, the method employed, the character of the soil and all other details of interest. My object is to have these experiments made on different soils and in different latitudes; and, in the course of two or three years, I hope to gather the results from all quarters, and we may thus be enabled to draw conclusions of much importance to grape-growers.

AMERICAN GRAPE-VINES ABROAD.

Having already referred (pp. 104, 114) to the large demand that has been made for some of our American vines to be used as stocks in the blighted districts of France,* it is only necessary to add that experience over there with such vines is by no means discouraging; and that it is not at all improbable that some of our varieties will be eventually grown there not only as stocks for the European *vinifera* but for their own grapes, just as they are to-day, on account of greater hardiness and vigor, superceding the European vines in some parts of Australia,

---

* Mr. Husmann estimates in the *Rural World* for January 9, 1875, that the importation of American cuttings into France, during the Winter of 1874-5 will amount to ten millions.

Of the varieties which have thus far given most satisfaction, may be mentioned the Herbemont, Cunningham, Clinton, Concord, and especially the variety called Jaques, and which, as we have already seen, is probably Lenoir.

APPENDIX.

SYNOPSIS OF THE AMERICAN SPECIES OF THE GENUS *PHYLLOXERA*, Fonscolombe.

[On account of the interest attaching to the Grape Phylloxera, or, as it is now very generally called, THE Phylloxera, I have prepared the following Synopsis of the N. A. species of the genus, and give it as it at first appeared in the *Comptes Rendus* of the Paris Academy of Science for December 14, 1874.]

1. P. VASTATRIX Planchon. *Pemphigus vitifoliæ* Fitch. *Peritymbia vitisana* Westwood. Forming galls on the leaves, and swellings on the roots of *Vitis*. Introduced into Europe and well known as the Grape Phylloxera.
2. P. RILEYI Lichtn. Mo. Ent. Rep. V, p. 66, note; ibid. VI, pp. 64 and 86. Living on the underside of the leaves, and hibernating on the stems of *Quercus alba*, *obtusiloba* and *bicolor*.
3. P. CARYÆFOLIÆ Fitch. N. Y. Ent. Rep. III, § 166. Forming conical galls, which open at the summit, on the upper side of the leaves of *Carya alba*.
4. P. CARYÆCAULIS (Fitch) *Pemphigus caryæcaulis* Fitch, ibid. § 163. *Daktylosphæra subellipticum* Shimer, Trans. Am. Ent. Soc. II, p. 389. *Dak. caryæ-magnum* Shimer, ibid. p. 391. Forming elongate, rather irregular, but generally ellipsoid smooth, green swellings of large size, on the petiole of the leaf of *Carya glabra* and *amara;* the gall subsequently cracking open and becoming black and contracted.
5. P. CARYÆVENÆ (Fitch). *Pemphigus ? caryævenæ* Fitch. N. Y. Ent. Rep. III, § 164. Forming plaits in the veins of the leaves of *Carya alba*, which plaits project up from the surface in an abruptly elevated keel upon the upper surface of the leaf, and with a mouth opening on the underside, the lips of which are wooly.
6. P. CARYÆ-SEMEN (Walsh). *Xerophylla caryæ-semen* Walsh. Proc. Ent. Soc. Phil., VI, p. 283. *Daktylosphæra caryæ-semen* Walsh, 1st Ann. Rep. as acting State Entomologist of Illinois, p. 23, note 1. *Dak. globosum* Shimer, Trans. Am. Ent. Soc., II, p. 391. Forming fuscous, minute, subglobular, seed-like galls on leaves of *Carya glabra*, the galls opening in a small nipple on the underside.
7. P. CARYÆ-GLOBULI Walsh, Proc. Ent. Soc. Phil. I, p. 309. *Daktylosphæra hemisphericum* Shimer, Trans. Am. Ent. Soc. II, p. 387. Forming hemispherical galls about 0.25 inch diameter on the upper surface of the leaves of *Carya glabra* and *alba*, the galls rather flat below, where they open in a slit.

8. P. SPINOSA (Shimer). *Dak. spinosum* Shimer, Trans. Am. Ent. Soc. II, p. 397. Forming large, irregular galls, covered with spines, on the petiole of the leaf of *Carya amara*, the galls opening beneath in an irregular, sinuate slit.

*9. P. CARYÆ-SEPTA (Shimer). *Dak. caryæ-septum*, ibid. p. 389. Forming flattened galls with a septum on the leaves of *Carya alba*, the galls opening both above and below. Probably only an abnormal form of No. 7.

10. P. FORCATA (Shimer). *Dak. forcatum* Shimer, ibid., p. 393. Forming galls much like those of No. 6, but larger.

11. P. DEPRESSA (Shimer). *Dak. depressum* Shimer, ibid., p. 390. Forming depressed galls on leaves of *Carya alba*, the gall opening below with a constricted mouth fringed with filaments. *Dak. coniferum* Shimer is, in all probability, the same.

*12. P. CONICA (Shimer). *Dak. conicum* Shimer, ibid., p. 390. Forming galls similar to No. 11, but without the fringe. Probably the same.

*13. P. CASTANEÆ (Haldeman). Fitch N. Y. Ent. Rep. III, § 200. Referred to *Chermes* by Haldeman, but undoubtedly a *Phylloxera*.

Those with a star (*) I am not personally familiar with, but I have no doubt they are good species. The others I am well acquainted with. We have also some undescribed species, the three following of which are so characteristic that I will briefly describe their galls:

14. P. CARYÆ-GUMMOSA N. sp. Forming pedunculated, ovoid or globular galls on underside of *Carya alba;* the gall white, pubescent, and gummy or sticky, opening below in a fibrous point. The eggs are almost spherical, pale and translucent. Larva, mother-louse and pupa quite pale, the red eyes and eyelets strongly contrasting. The winged insects with difficulty distinguished from some of the other species, a difficulty made all the greater from the fact that other species get caught in the sticky surface of the gall.

15. P. CARYÆ-REN N. sp. Forming numerous, more or less confluent, mostly reniform galls on the petiole and leaf stems of *Carya glabra;* the galls varying from 0.2 to 0.7 inch in diameter, pale green and densely pubescent, and opening in a slit the whole of their length, transversely with the axis of the petiole.

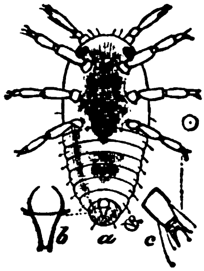
16. P. CARYÆ-FALLAX N. sp. Forming conical galls thickly crowded on the upper surface of the leaves of the *Carya alba*. Strongly resembling No. 3 (*caryæ-foliæ*) but the hight one-third greater than the basal diameter, and opening below, instead of above, in a circular fuzzy mouth. This is the species briefly referred to under the same name by Walsh, First Ann. Rep. etc., p. 23, note.

Thus we have at least sixteen good, undoubted species inhabiting the United States. Most of them are more easily distinguished, as is often the case with *Cynipidæ* in Hymenoptera, and *Cecidomyidæ*, in Diptera, by their habits and the peculiar galls they form, than by colorational or structural differences. In fact all the species, except, perhaps, Nos. 1 and 2, yet need more careful and discriminating study and descriptions, in all stages from the living material.

THE AMERICAN OAK PHYLLOXERA—*Phylloxera Rileyi* Lichtn.

Through the kind assistance of Miss Mary E. Murtfeldt, who, at my request, watched this species most closely and assiduously from its awakening to activity in the Spring till its dormancy in the Fall, and was thus enabled to supplement my own observations which were unavoidably interrupted by other duties, I have been able to add many positive facts to what was previously known of its natural history—facts which are interesting and valuable in this connection as throwing light on the natural history of the congeneric Grape species. Undergoing all its changes above ground, the evolution of the Oak Phylloxera is much more easily studied than is that of the Grape Phylloxera; and I have had better fortune in obtaining the sexual individuals from the winged females, though the few specimens mounted so as to be of any value for description, are all males. These beings are so excessively minute that their study is attended with many difficulties, unless one can devote more time to it than has been at my disposal; yet, with the exception of the description of the true female, its natural history may now be considered complete; while the thorough observations of Balbiani on the closely allied European *Phylloxera quercus** Fonsc., will supply inferentially the missing data. We saw last year that the American Oak Phylloxera hibernates in the larva state attached to the twigs. "As the leaves begin to put forth, our young Oak Phylloxera cast off their Winter skin, and their lethargy with it. They may then be seen crawling up and down the twigs, but do not settle on the leaves. Attaining, in a few days, full growth, they begin a virginal reproduction by covering the twigs with eggs, which hatch in just about a week if the weather is warm and propitious. Thus the hibernating lice acquire their growth, and give birth to the first generation, in the short space intervening between the opening of the buds and the full growth of the first leaves."—[6th Report, p. 65. This first generation, which is sufficiently numerous, as the hibernating mothers are very prolific, disperses over the leaves, and one generation of parthenogenetic wingless females, follows another till the fifth or sixth, when, from the middle to the end of July, the winged females begin to appear. There is the same diminution in fecundity, until the appearance of the winged individuals that has been observed by Balbiani in the European *quercus;* and the winged females, just as in the other species, bear only a few eggs of two sizes, which give birth to the sexual individuals. These pair and the female lays the solitary egg, which gives birth to the normal parthenogenetic mother, which hibernates as a larva. The variation to which the species is subject; or rather the different forms which it presents, will be appreciated by the scientific reader from the following specific diagnosis:

[Fig. 22.]



Male Phylloxera Rileyi, showing genital organ (*b*) and tarsus (*c*); the dot at side showing natural size.

SPECIFIC DIAGNOSIS OF PHYLLOXERA RILEYI Lichtn.

Apterous, agamous ♀; normal form (*a*):—

Length, 0.016 inch, or rather more than 1-3 as large as *vastatrix*, with which it agrees in color. Proportionally more slender, with the abdomen more tapering. Body insected and covered with tubercles very much as in wingless *radicicola* form of *vastatrix*, but with an additional pair on the head, and those on the seventh abdominal joint always distinct. These tubercles concolorous with the body, fleshy, more or less elongate—from 1-12—1-6 the width of middle body—and surmounted at tip with a short, dark hair. The anterior tubercles longest; the lateral outline showing a series of thirty-six such tubercles, nearly equidistant, springing at about right angles from surface. The intermediate dark points, on thoracic insections, also as in *vastatrix*. Antennæ precisely as in *vastatrix*. Legs with the ends of tibiæ more swollen, and the claws more prominent. Venter, with a dusty tubercle just inside each coxa.

---

* There is some confusion as to what should really be considered the *quercus* of Fonscolombe, and Signoret, Balbiani and Lichtenstein have each in turn recently endeavored to define the European species. Signoret would reduce them all to three (*Comptes Rendus*, Dec. 7, 1874), as follows: 1. *Ph. quercus* Fonsc =*Balbianii* Lichtn.=*coccinea* Balb. 2. *Ph. coccinea* Kalt.=*quercus* (Sign.)=*coccinea* Hayden. 3 *Ph. corticalis* Kalt.=*Lichtensteinii* Balb.=*Rileyi* Lichtn. Lichtenstein, on the contrary, makes four species (*ibid*, Feb. 8, 1875), as follows: 1. *Ph. quercus* Fonsc.=*coccinea* Hayden. 2. *Ph. Rileyi* Lichtn.=*corticalis* Kollar.=*Lichtensteinii* Balb. 3. *Ph. Balbianii* Licht. 4. *Ph. acanthochermes* Kollar.=*scutifera* Sign. In either event the genus is much more poorly represented there than in America. I would remark here also that I very much doubt whether our American Oak species occurs in Europe, however closely the *corticalis*, which differs in habit, may resemble it in appearance.

Google

Deep yellow Form, with longer, roughened Tubercles (b):—

As frequent as *a* in July, and differing in the deeper color, inclining to brown, and in the greater length, irregularity, and darker color of tubercles: these tubercles are generally longest on middle body, and appear quite dark under a pocket lense; under the microscope they appear quite roughened with fleshy points from the sides toward the swollen base, and around the somewhat blunt, and sometimes slightly swollen tip.

Black Form, with very long Tubercles (c):—

With the body dark brown and the tubercles almost black; the dorsal ones, especially in middle of body, very long—half the diameter of body—slender, gradually tapering to tip, the lateral ones and some of the dorsal ones, less tapering and half as long. Antennæ with the third joint quite long and slender.

Pupa, normal Form (d):—

With the tubercles prominent, and the pale, mesothoracic portion occupying more of the body than in *vastatrix*.

Smooth Form (e):—

More elongate, paler, without tubercles. Only occasionally met with.

Winged, agamous ♀ (f):—

With the dark, mesothoracic band much as in *vastatrix;* the wings more slender, and somewhat more fuliginous, with the costal angle more produced and blunt, and the hook larger on secondaries; the antennæ with the third joint and the horny parts proportionally longer. Also presenting two forms of body and wings as in *vastatrix*.

Male (g):—

Not much larger than the newly-hatched larva; without tubercles, having but a few faint, hair-like points in their stead: the two tarsal claws distinct, but the basal joint of tarsus obsolete: the antennæ simple (at least there is, if anything, but the faintest trace of a small plate at tip): no sign of mouth-parts; the venter sometimes shows two opaque spots about middle, and the penis is quite conspicuous, the external parts seeming to consist of a tubercle which is bulbous at base, but pointed at tip, and of two dusky, apparently horny processes which run down each side as if to protect it.*

(The eight specimens obtained from winged ♀, which I have mounted, all seem to be of one sex, unfortunately, and no ♀ is among them.)

Newly-hatched Larva (h):—

Nearly smooth, with dark limbs and eyes, the tubercles indicated by slight swellings, which are, however, surmounted with a longer fleshy hair. The proboscis reaching beyond tip of abdomen.

Hibernating Larva (i):—

With the tubercles quite large, smooth, and surmounted at tip with a single spinous hair.

The true female yet remains to be described. Most entomologists would consider the forms *c* and *e* as specifically distinct from *Rileyi*—so abdormal do they appear: but a careful Summer's study of our Oak Phylloxera leads me to the conclusion that they are but forms of one and the only species occurring on the Oak in America. In fact, the polymorphism of these insects is not yet sufficiently appreciated even among entomologists; and I am strongly inclined to believe that the discussion about the different species occurring on Oak in Europe, is based, in great part, on the variations of a single species. The tubercles in *Rileyi* vary somewhat with each molt, and I have come to look upon the paleness or intensity of color as of little specific value.

At least five generations intervene from the mothers which hibernate to the winged form appearing first in July; and, from having enclosed some of the first winged females in muslin bags covering leaves that were carefully freed of all insect life; and having subsequently found such leaves infested with the ordinary agamous female with her progeny in all stages, there is reason to believe that the winged mothers may be produced twice a year; *i. e.* there are two full cycles of development annually. It is quite evident to me, however, that there is no great regularity as to the time of the appearance of either the winged or sexual individuals; or even as to the number of generations intervening between two generations of winged mothers: so much depends on conditions, and the species is so easily influenced in its development by the character of the weather and food conditions. Thus, the winged mothers are much more abundant on young trees with tender succulent foliage than on the tougher leaves of the larger trees; and I am pretty confident that it is no particular generation that hibernates; but that it may be either the first, second, third, etc., from the impregnated egg, according as we have early or late cold weather. From August the insects continue to grow and multiply, with decreasing rapidity however, until the leaves commence to turn. The mothers then gradually perish and the young forsake the leaves and crowd around the stems; this happening in 1874, from the middle to the end of October.

---

* These males are so very minute, that the generative organ is not easily resolved, and presents a different appearance, according to position on the slide; but in most cases I could discern these dusky processes with sufficient distinctness.

Whether with this species, as in the case of the Grape, and the European Oak species, some of the wingless, agamous females also lay the sexual eggs precisely as do the winged females, I have not yet ascertained; though I have no reason to doubt that such will prove to be the case.

THE ROCKY MOUNTAIN LOCUST—*Caloptenus spretus* Thomas.*

(Ord., ORTHOPTERA; Fam., ACRIDIDÆ.†)

This insect is a fit subject for the close of that portion of the present Report which comes under the head of "Noxious Insects." Few, indeed, are there more noxious than this plague of the West, which in 1874 proved a national calamity, reducing untold thousands to misery and distress. Feeling the importance of the subject, I spent some time in the ravaged districts of Kansas, and carefully studied the habits of the pest as it poured into our western counties.

ITS NATURAL HISTORY.

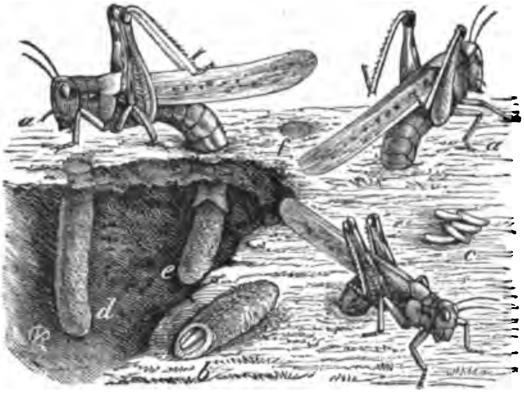
The life-history of this insect is essentially the same as that of the more common locusts that are with us every year. The female, when about to lay her eggs, forces a hole in the ground by means of the two pairs of horny valves which open and shut at the tip of her abdomen, and which, from their peculiar structure, are admirably fitted

---

* The species was named in MS. by Mr. P. R. Uhler, of Baltimore, Md., but never by him described. Mr. B. D. Walsh subsequently (*Pract. Ent.* II, p. 1) adopted Mr. Uhler's name in connection with a partial description; but Mr. Thomas first fully defined the species, as here distinguished and referred to by me. The question as to the validity of the species will be discussed in the proper place.

† *Locustidæ* of Westwood.

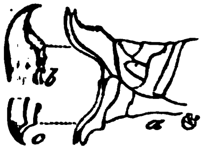
[Fig. 23.]



ROCKY MOUNTAIN LOCUST:—*a*, *a*, *a*, female in different positions, ovipositing; *b*, egg-pod extracted from ground, with the end broken open, showing how the eggs are arranged; *c*, a few eggs lying loose on the ground; *d*, *e*, shows the earth partially removed, to illustrate an egg-mass already in place, and one being placed; *f*, shows where such a mass has been covered up.

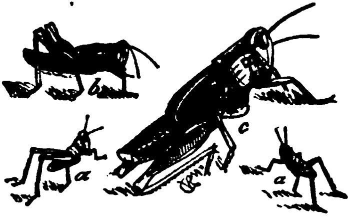
for the purpose. (See Fig. 24, where *b*, *c* show the structure of one of each of the upper and lower valves) With the valves closed she pushes the tips in the ground, and by a series of muscular efforts and the continued opening and shutting of the valves, she drills a hole until, in a few minutes (the time varying with the nature of the soil) the whole abdomen is buried, the tips reaching an inch or more below the surface, by means of great distention. Now, with hind legs hoisted straight above the back, and the shanks hugging more or less closely the thighs, she commences ovipositing, the eggs being voided in a pale, glistening and glutinous fluid which holds them together and binds them into a long cylindrical pod, covered with particles of earth which adhere to it. When fresh the whole mass is soft and moist, but it soon acquires a firmer consistency. It is often as long as the abdomen, and usually lies in a curved or slanting position. It is never placed much more than an inch below the surface, except where some vegetable root has been followed down and devoured, and the insect leaves her eggs before emerging; in this way the mass is sometimes placed a foot below the surface. The eggs which compose this mass are laid side by side to the number of from 30 to 100, according to size of mass. They are 0.15 to 0.20 inch long, one-fourth as wide, slightly curved, of a pale yellow color, and rather larger at the anterior than the posterior end. As the hatching period approaches, they become more plump and pale, and the embryo, with its dark eyes, is visible through the shell which is now somewhat transparent. The opening to this egg-mass is covered up by the mother, but the newly hatched insect has no difficulty in escaping. When first hatched the little hopper is quite pale, but soon becomes mottled with gray and brown. In escaping from the egg it is at first covered with a delicate

[Fig. 24.]



ROCKY MOUNTAIN LOCUST:—Anal characters of female, showing horny valves.

[Fig. 25.]



Rocky Mountain Locust:—*a*, *a*, newly hatched larvæ; *b*, full grown larva; *c*, pupa.

white pellicle which has to be cast off before there can be freedom of motion; so that the insect may be said to molt as soon as it is born. Except in having a narrower pro-thorax, sloping roof-fashion to a median ridge, and in lacking wings, the young locust scarcely differs in structure from its parent; and the perfect winged form is gradually assumed through a series of four molts, during the first three of which the wing-pads become larger, and during the last, from the pupa (Fig. 25, *c*,) to the perfect state, the thorax becomes flattened, the wings are acquired and the insect ceases to grow and is ready to procreate. The time required from hatching till the wings are obtained averages about two months. The high and long flights characteristic to the species after the wings are acquired, are seldom indulged, except when there is a fair wind.

Just as the mature insects fly, as a rule, in a southeasterly direction, so the young, soon after they hatch, manifest the same desire to move toward the southeast. They are most active in the heat of the day, but are perhaps more ravenous at night. They migrate short distances every clear day, but do not like to cross a stream unless they can jump it. If driven into water, however, they kick about, making considerable progress, and do not easily drown. Such at least are the habits of the young hatched in the Mississippi Valley, though it is very probable that in their native table lands of the mountain region the migrating habit is not developed till they have acquired wings, and are forced from hunger to seek new quarters.

THE EGGS ARE LAID BY PREFERENCE

In bare, sandy places, especially on high, dry ground, which is tolerably compact and not loose. It is generally stated that they are not laid in meadows and pastures, and that hard road-tracks are preferred; in truth, however, meadows and pastures, where the grass is closely grazed are much used for ovipositing by the female, while on well traveled roads she seldom gets time to fulfill the act without being disturbed. Thus a well traveled road may present the appearance of being perfectly honey-combed with holes, when an examination will show that most of them are unfinished, and contain no eggs; whereas a field covered with grass-stubble may show no signs of such holes and yet abound with eggs. Furthermore, the insects are more readily noticed at their work along roads and roadsides than in fields, a fact which has also had something to do in forming the popular impression. Newly broken or plowed land is not liked; it presents too loose a surface. Moist or wet ground is always avoided for the purpose under consideration. During the operation the female is very intent on her work and may be gently approached without becoming alarmed, though when suddenly disturbed she makes great efforts to get away and extricates her abdomen in the course of half a minute or more.

THE MIGRATORY INSTINCT AND GREAT DESTRUCTIVE POWER BELONG TO BUT ONE SPECIES WEST OF THE MISSISSIPPI.

Being anxious to ascertain whether the injuries reported in the different parts of the country between the Mississippi and the Rocky Mountains were all caused by one species, or whether others joined their forces in devastating the country, I took some pains to procure specimens from as many different localities as possible. What with specimens collected in previous years in Colorado, and received from Missouri and Texas, and those obtained in 1874, I now have material from Manitoba, Minnesota, Nebraska, Iowa, Colorado, Kansas, Missouri, Indian Territory and Texas. In each instance it is the same species that proves such a scourge. As we shall presently see, the same species occurs in Wyoming, Utah, Idaho, Nevada, Montana and Arizona. I know nothing of the migratory species which at times does damage in California and other parts of the country west of the Rocky Mountains; some have supposed it to be *Œdipoda atrox* Scudder; but I agree with Mr. Thomas that, with its comparatively short wings, this species cannot sustain lengthened flight, and the probability is that the *spretus* under consideration, or a race of it, is the culprit.

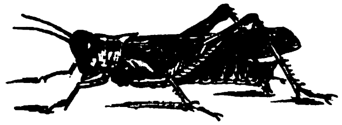
Only occasionally do specimens of some of the more common species accompany the migratory one. Thus the larger and common species, the Two-striped Locust (*Coloptenus bivittatus*, Say) and the Differential Locust (*C. differentialis*, Walk.) which are incapable of migrating to any great distance, and which are common in the Mississippi Valley, have occasionally been caught with the *spretus*, and sent to me with it. Already existing in the country invaded by the Rocky Mountain species, they were simply gathered up with it.

Yet, while no other species possesses such wonderful migratory habits, several become so enormously multiplied during certain years in their native homes as to commit very serious injury to vegetation. Of these, I shall speak more fully further on.

EASILY CONFOUNDED WITH THE RED-LEGGED LOCUST.

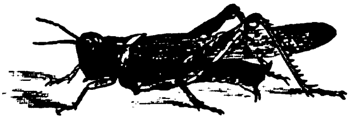
In my endeavors to accurately map out the territory in our State invaded in 1874 by the Rocky Mountain Locust, I have been frequently puzzled by accounts from counties east of the limit-line presently indicated. In every such instance, where I have been able to obtain specimens, they proved to be the common Red-legged Locust. This last species is common in most of the States, extending to the Atlantic, and is even reported in parts of the Rocky Mountain region, where the Migratory species is at home. The two bear such a close general resemblance that even entomologists have doubted their specific distinctness; and indeed size and colorational characters would not suffice to separate the exceptional individuals which depart most from the typical characters of their species, and approach most to those of the other. Yet they are distinct, as species go, and in order to properly study the distribution of the Rocky Mountain species, and its power of becoming acclimated in the Mississippi Valley or not, it is of the first importance that observers confound not the two species. Hence, I shall describe in detail the two insects. From these details, which follow, it is evident that the distinguishing characters, most easily observed by the non-entomologist, are the relative length of wing, and the structure of the terminal joint of the male abdomen, which is turned up like the prow of a ship—this last character being the most important and constant. The Rocky Mountain species has the wings extending, when closed, about one-third their length beyond the tip of the abdomen, and the last or upturned joint of the abdomen narrowing like the prow of a canoe, and notched or produced into two tubercles at top. The wings of the Red-legged Locust extend, on an average, about one-sixth their length beyond the tip of the abdomen, and the last abdominal joint is shorter, broader, more squarely cut off at top, without terminal tubercles, and looking more like the stern of a barge.

[Fig. 26.]



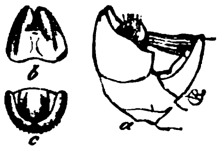
Red-legged Locust.

[Fig. 27.]



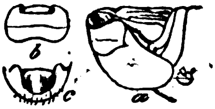
Rocky Mountain Locust.

[Fig. 28.]



Rocky Mountain Locust:—Anal characters of male; *a*, side view; *b*, *c*, hind and top views, of tip.

[Fig. 29.]



Red-legged Locust: Anal characters of male; *a*, side view; *b*, *c*, hind and top views, of tip.

DESCRIPTIVE.

The large amount of material above referred to has enabled me to make very thorough comparisons between the two species. The genus *Caloptenus* to which the species belongs, is distinguished principally by the stoutness of the spine-like tubercle on the fore-breast between the front legs, and by the tip of the abdomen in the male being much swollen. Mr. Cyrus Thomas, in his admirable work on the "Acrididæ of N. A." has published good descriptions of the known N. A. species, and I will transfer what he has said of the two in question—adding only some subsidiary remarks in brackets and at the close:

CALOPTENUS FEMUR-RUBRUM, Burm. Handb. Ent., II, 638.
Syn. *Acridium femur-rubrum*, Deg. Ins., III, Pl. 42, Fig. 5, p. 498.
" *femorale*, Oliv.. Encyl. Meth., 121 Ins. VI, 228.
Gryllus (*Locusta*) *erythropus*, Gmel., Linn. Syst. Nat. I, IV, 2086.

"Grizzled with dirty olive and brown; a black spot extending from the eyes along the sides of the thorax; [but never onto the third lobe]; an oblique yellow line on each side of the body beneath the wings; a row of dusky, brown spots along the middle of the wing-covers; and the hindmost shanks and feet blood-red, with black spines. The wings are transparent, with a very pale greenish-yellow tint next to the body, and are netted with brown lines. The hindmost thighs have two large spots on the upper side, and the extremity black [more correctly three such spots, or including the extreme one at tip, four: Harris seems to have overlooked the basal one]; but are red below, and yellow on the inside. The appendages at the tip of the body in the male are of a long triangular form. Length from [to tip of abdomen] 0.75 to 1 inch; expansion of wings 1.25 to 1.75 inches." As this species, which is so common, varies considerably, I have concluded to give Dr. Harris's description without change, adding the following: Vertex but slightly depressed, with a minute angular expansion in front of the eyes; frontal costa usually but slightly sulcate; sides parallel. Eyes large and rather prominent. Elytra and wings generally a little [usually extending about 1-6 their length beyond the abdomen] longer than the abdomen. The cerci of the male rather broad and flat [longer and narrower towards tip than in spretus]; apex of last ventral segment entire and truncate. The yellow stripes on the side extend from the base of the wing to the insertion of the posterior femora. The ground color varies with localities and age, and most of the specimens from one or two sections appear to have unspotted elytra; sometimes a reddish-brown tint prevails; at others a dark-olive; at others a dark purplish-brown; yet the markings generally remain the same.

Localities.—Maine, Massachusetts, Connecticut, New York, Pennsylvania, Maryland, Tennessee, Illinois, Minnesota, Ohio, Nebraska, Missouri, Kansas, Colorado, Wyoming, Vancouver's Island (?), west coast of America (?)—[Thomas, *Acrididæ* of N. A. (1873), pp. 163-4.

In addition to what Mr. Thomas states of the variation in color, it may be added that the dark marks on the hind thighs are in exceptional specimens wholly wanting, and in others so confluent that the whole of the upper part is brown-black. In order to show how variable (within certain limits, however,) is the relative length of wing, I will add measurements of over eighty specimens, all taken in St. Louis county. As the length of the abdomen is an uncertain criterion, varying according as this last is distended with eggs or contracted from one cause and another, I have made these measurements from the juncture of the hind thighs and shanks. The specimens were killed in the cyanide bottle, and while yet fresh and supple laid flat on a scale divided into hundredths of an inch. The furthermost hind leg was then stretched until the suture between shank and thigh was just visible above the inner border of the front wings. Careful measurements were then taken, first of the whole body, second of the extent of wing beyond the base of shank, third of extent of abdomen beyond the the same. It will be understood that as the abdomen shrinks slightly in drying, and the wings do not, the figures in the fourth column in all these tables are somewhat lower than if taken from dry specimens. The tables showing these measurements will prove interesting when compared with that further on, giving similar measurements of *spretus*, and conclusively show by comparing the figures in the fourth column that the specific distinction cannot, as Mr. Walsh thought, be safely and solely left to length of wing beyond the abdomen; as specimens of either species may approach each other in this respect to within the hundredth of an inch, and might be found to entirely agree if larger suites were compared. Nevertheless this relative length of wing has great value as a specific character, since of all the specimens measured, in even the longest winged *femur-rubrum* the wings fall short one hundredth of an inch of extending as far beyond the abdomen as they do in the shortest winged *spretus*. The anal characters of the male, (Fig. 29) will be found pretty constant and reliable. Yet they also vary and frequently approach *spretus* in the narrowing notched form of the tip. In the female the anal characters are of less value in distinguishing the species.

CALOPTENUS FEMUR-RUBRUM.

Measurements of the Male; in Hundredths of an Inch.

Whole length from front of head to tip of wing.	Length of wing beyond base of tibia.	Length of abdomen beyond base of tibia.	Length of wing beyond tip of abdomen.
0.95	0.03	0.03	0.00
1.05	0.04	0.03	0.01
1.00	0.03	0.02	0.01
1.03	0.04	0.03	0.01
1.03	0.04	0.03	0.01
1.03	0.05	0.03	0.02
0.98	0.02	0.00	0.02
1.08	0.05	0.03	0.02
0.97	0.02	0.00	0.02
1.06	0.10	0.08	0.02
1.03	0.04	0.02	0.02
0.94	0.02	0.00	0.02
1.06	0.08	0.05	0.03
1.10	0.09	0.06	0.03
1.02	0.03	0.06	0.03
1.04	0.05	0.02	0.03
1.10	0.08	0.04	0.04
0.95	0.09	0.05	0.04
0.99	0.08	0.04	0.04
1.05	0.08	0.04	0.04
1.08	0.09	0.05	0.04
1 08	0.10	0.06	0.04
1.09	0.08	0.03	0.05
0.99	0.05	0.00	0.05
1.04	0.05	0.00	0.05
1.05	0.06	0.00	0.06
1.12	0.12	0 05	0.07
1.05	0.08	0.00	0.08

Measurements of Female.

Whole length from front of head to tip of wing.	Length of wing beyond base of tibia.	Length of abdomen beyond base of tibia.	Length of wing beyond tip of abdomen.
1.22	0.13	0.15	0.00
1.15	0.13	0.15	0.00
1.05	0.04	0.05	0.01
1.08	0.09	0.10	0.01
1.20	0.13	0.14	0.01
1.15	0.03	0.03	0.01
1.03	0.04	0.04	0.01
1.10	0.06	0.05	0.01
1.06	0.03	0.02	0.01
1.06	0.03	0.02	0.01
1.08	0.03	0.02	0.01
1.08	0.04	0.03	0.02
1.05	0.03	0.02	0.02
1.09	0.06	0.04	0.02
1.15	0.14	0.12	0.02
1.04	0.02	0.00	0.02
1.08	0.02	0.00	0.02
1.04	0.03	0.00	0.03
1.09	0.08	0.05	0.03
1.03	0.03	0.00	0.03
1.08	0.12	0.09	0.03
1.04	0.03	0.00	0.03
1.10	0.06	0.03	0.03
1.13	0.14	0.10	0.04

Measurements of Female—Continued.

Whole length from front of head to tip of wing.	Length of wing beyond base of tibia.	Length of abdomen beyond base of tibia.	Length of wing beyond tip of abdomen.
1.13	0.08	0.04	0.04
1.08	0.04	0.00	0.04
1.13	0.09	0.05	0.04
1.18	0.12	0.08	0.04
1.13	0.09	0.05	0.04
1.15	0.13	0.08	0.05
1.09	0.08	0.03	0.06
1.15	0.13	0.08	0.05
1.19	0.15	0.10	0.05
1.19	0.14	0.09	0.05
1.04	0.05	0.00	0.05
1.19	0.14	0.08	0.06
1.15	0.14	0.08	0.06
1.18	0.08	0.02	0.06
1.18	0.14	0.08	0.06
1.13	0.09	0.03	0.06
1.13	0.09	0.02	0.07
1.06	0.10	0.03	0.07
1.09	0.10	0.03	0.07
1.13	0.10	0.03	0.07
1.15	0.10	0.03	0.07
1.15	0.08	0.00	0.08
1.12	0.08	0.00	0.08
1.14	0.15	0.06	0.09
1.18	0.09	0.00	0.09
1.10	0.13	0.04	0.09
1.16	0.12	0.03	0.09
1.19	0.23	0.12	0.11
1.15	0.14	0.03	0.11
1.13	0.12	0.00	0.12

CALOPTENUS SPRETUS Uhler Mss.

Syn., *Acridium spretum** Thos. Trans. Ill. St. Agr. Soc, V, 450.

Very much like *C. femur-rubrum*, Burm., the principal difference being in the length of the elytra and wings; a notch at the tip of the last [♂] ventral segment. Posterior lobe of the pronotum slightly expanding; median somewhat distinct. Elytra and wings pass the abdomen about one-third their length. The last [♂] ventral segment, which is turned up almost vertically, is somewhat tapering and is notched at the apex, which distinguishes it from the *femur-rubrum;* the notch is small, but is distinct. Prosternal spine robust, sub-cylindrical, transverse. Migratory.

Color.—Scarcely distinct from the *C. femur-rubrum.* The occiput and disk of the pronatum generally reddish-brown; the posterior lobe somewhat paler than the anterior and middle. Spots, as in *femur-rubrum,* arranged in a line along the middle of the elytra; these are a little larger and more abundant towards the apex. The head and thorax are sometimes a very dark olive-brown, at others, reddish-brown, and even brownish-yellow, the color deepening with age. The wings are pellucid, nerves dusky toward the apex; when flying high and against the sun, their wings look like large snow flakes.

Dimensions.—♀ Length, [to tip of abdomen] 1 to 1.2 inches; elytra as long as the body; posterior femora, 0.55 inch; posterior tibiæ, 0.5 inch. ♂ Length, 0.85 to 1 inch; elytra, 0.9 to 1.05 inches.

---

*This is called "*Acridium spretus*, Uhler" in the article alluded to, and I very much doubt if the description refers to the species in question; first, because I do not believe that *spretus* occurs in Murphysboro, Ills., where Mr. Thomas was then residing, and where he quotes *Acridium spretis* as being quite common; secondly because the description in some respects would not apply to *spretus* as at present defined. I call attention to this discrepancy, because it is upon this (as I believe erroneous) reference, that Mr. Thomas quotes *spretus* from Illinois; whereas I agree with Mr. Walsh that (as we understand the species to-day) it is not indigenous to that State. Where the anal characters of the male are not carefully given, it is impossible to be sure of the species.

Illinois, [very questionable], Iowa, Missouri, Nebraska, Kansas, Colorado, Wyoming, Utah, Idaho, Nevada, Montana, Minnesota, and Dakota. (Thomas, by examination and collections in person); Minnesota, Wisconsin [doubtful], Dakota (Scudder); Texas, Arizona, British America (Thomas)—[Thomas, *Acrididæ* of N. A., pp. 164–5.

Regarding coloration, as with *femur-rubrum*, it is quite variable, and the dead specimens convey a very imperfect idea of the living colors, which are thus given in my notes taken in the field. The more common specimens are yellowish-white beneath; glaucous across the breast and about mouth-parts; pale bluish-glaucous—often with shades of purple—on the sides of the head and thorax and on the front of the face; olive-brown on the top of head and thorax; pale beneath, more or less bluish above and marked with black, especially towards base, on the abdomen. The front wings have the ground-color pale grayish-yellow, inclining to green, and their spots and veins brown; the hind wings, except a yellowish or brownish shade at apex and along the front edge and a green tint at base, are transparent and colorless, with the veins brown. The front and middle legs are yellowish. The hind legs have the thighs striped with pale glaucous and reddish on the outside and upper half of inside, with four broad black or dusky marks on the upper edge, the terminal one extending beneath around the knee. The shanks are coral-red with black spines; the feet somewhat paler, with black claws; antennæ pale yellow; palpi tipped with black. In the dead specimens all these colors become more dingy and yellow. Palpi and front legs in some specimens tinged with red or blue; the hind tibiæ sometimes yellowish instead of red, especially in the middle.

Larva—When newly hatched, the larva is of a uniform pale gray without distinctive marks. It soon becomes mottled with the characteristic marks however. After the first molt the hind thighs are conspicuously marked on the upper outside with a longitudinal black line; the thorax is dark with the median dorsal carina and two distinct lateral stripes pale yellow, the black extending on the head behind the eyes. The sides of the thorax then become more yellow with each molt, the black on the hind thighs less pronounced, and the face at first black and then spotted. The occiput and abdomen above are mottled with brown, the former marked with a fine median, and two broader anteriorly converging pale lines, the latter with two rather broken lateral lines of the same color.

Pupa—The pupa is characterized by its paler, more yellow color, bringing more strongly into relief the black on the upper part of the thorax and behind the eyes; by the spotted nature of the face, especially along the ridges, by the isolation of the black subdorsal mark on the two anterior lobes of prothorax, and by the large size of the wing-pads, which—visible from the first molt and increasing with each subsequent molt—are now dark, with a distinct pale discal spot, and pale veins and borders. The hind shanks incline to bluish rather than red as in the mature insect.

In the following table of measurements, introduced for comparison with that given of *femur-rubrum*, the same rules were adopted as in the other case, and particular pains were taken to get specimens from as many parts of the ravaged country as possible; also, by study of the structural and other peculiarities of *spretus* to guard against the chance mixing of specimens of *femur-rubrum*.

CALOPTENUS SPRETUS.

Measurements of the Male; in Hundredths of an Inch.

Whole length from front of head to tip of wing.	Length of wing beyond base of tibia.	Length of abdomen beyond base of tibia.	Length of wing beyond tip of abdomen.
1.24	0.25	0.05	0.20
1.20	0.28	0.08	0.20
1.29	0.28	0.08	0.20
1.18	0.33	0.12	0.21
1.26	0.25	0.03	0.22
1.22	0.29	0.06	0.23
1.10	0.29	0.05	0.24
1.33	0.29	0.04	0.25
1.33	0.35	0.09	0.26
1.24	0.29	0.03	0.26
1.29	0.35	0.08	0.27
1.30	0.32	0.05	0.27
1.30	0.35	0.08	0 27
1.28	0.35	0.08	0.27
1.29	0.32	0.05	0.27
1.24	0.30	0.03	0.27
1.19	0.33	0.06	0.27
1.28	0.36	0.09	0.27
1.28	0.30	0.02	0.28
1.24	0.38	0.09	0.29
1.35	0.39	0.10	0.29
1.23	0.38	0.09	0.29
1.35	0.35	0.05	0.30
1.35	0.40	0.10	0.30
1.35	0.34	0.03	0.31
1.30	0.34	0.03	0.31
1.33	0.33	0.02	0.31
1.25	0.34	0.03	0.31
1.32	0.34	0.03	0.31
1.30	0.34	0.03	0.31
1.18	0.34	0.02	0.32
1.38	0.40	0.08	0 32
1.38	0.42	0.09	0.33
1.40	0.38	0.05	0.33
1.28	0.38	0.05	0.33
1.30	0.35	0.02	0.33
1.24	0.38	0.04	0.34
1.30	0.38	0.03	0.35
1.40	0.38	0.03	0.35
1.33	0.35	0.00	0.35
1.33	0.38	0.03	0.35
1.35	0.38	0.02	0.36
1.34	0.38	0.02	0.36
1.29	0.38	0.02	0.36
1.33	0.35	0.02	0.37
1.36	0.43	0.06	0.37
1.38	0.34	0.05	0.39
1.33	0.36	0.03	0.39

Measurements of Female.

Whole length from front of head to tip of wing.	Length of wing beyond base of tibia.	Length of abdomen beyond base of tibia.	Length of wing beyond tip of abdomen.
1.25	0.28	0.15	0.13
1.23	0.33	0.18	0.15
1.28	0.40	0.23	0.17
1.34	0.30	0.12	0.18
1.38	0.40	0.22	0.18
1.29	0.24	0.06	0.18
1.33	0.38	0.19	0.19
1.44	0.38	0.19	0.19
1.25	0.39	0.19	0 20
1.38	0.43	0.23	0.20
1.24	0.33	0.13	0.20
1.25	0.32	0.12	0.20
1.15	0.33	0.13	0.20
1.35	0.42	0.20	0.22
1.28	0.40	0.18	0.22
1.30	0·40	0.18	0.22
1.33	0.43	0.20	0.23
1.29	0.28	0.05	0.23
1.35	0.33	0.10	0.23
1.16	0.36	0.13	0.23
1.48	0.38	0.15	0.23

Measurements of Female—Continued.

Whole length from front of head to tip of wing.	Length of wing beyond base of tibia.	Length of abdomen beyond base of tibia.	Length of wing beyond tip of abdomen.
1.28	0.38	0.15	0·23
1.30	0.36	0.13	0.23
1.29	0.36	0.12	0.24
1.30	0.42	0.18	0.24
1.33	0.28	0.04	0.24
1.35	0.32	0.08	0.24
1.33	0.39	0.15	0.24
1.30	0.42	0.18	0.24
1.35	0.43	0.19	0.24
1.26	0.30	0.06	0.24
1.38	0.40	0.16	0.24
1.33	0.36	0.12	0.24
1.24	0.33	0.08	0.25
1.29	0.38	0.13	0.25
1.45	0.43	0.18	0.25
1.50	0.43	0.18	0.25
1.33	0.33	0.08	0.25
1.30	0.43	0.18	0.25
1.30	0.33	0.08	0.25
1.25	0.30	0.04	0.26
1.30	0.35	0.09	0.26
1.28	0.32	0.06	0.26
1.34	0.30	0.04	0.26
1.36	0.34	0.08	0.26
1.25	0.38	0.12	0.26
1.45	0.52	0.16	0.26
1.45	0.44	0.18	0.26
1.25	0.30	0.04	0.26
1.39	0.45	0.18	0.27
1.52	0.40	0.13	0.27
1.26	0.36	0.09	0.27
1.28	0.40	0.13	0.27
1.28	0.35	0.08	0.27
1.33	0.33	0.06	0.27
1.33	0.35	0.08	0.27
1.28	0.35	0.08	0.27
1.26	0.39	0.12	0.27
1.38	0.42	0.15	0.17
1.30	0.40	0.13	0.27
1.23	0.35	0.08	0.27
1.43	0.30	0.02	0.28
1.29	0.36	0.08	0.28
1.28	0.38	0.10	0.28
1.30	0.36	0.08	0.28
1·35	0.43	0.15	0.28
1.30	0.43	0.15	0.28
1.33	0.38	0.10	0.28
1.38	0.42	0.13	0.29
1.15	0.38	0.09	0.29
1.38	0:42	0.13	0.29
1.35	0.42	0.13	0.29
1.36	0.39	0.10	0.29
1.29	0.38	0.09	0.29
1.38	0.43	0.14	0.29
1.28	0.38	0.09	0.29
1.33	0.39	0.10	0.29
1.36	0.34	0.04	0.30
1.45	0.43	0.13	0.30
1.38	0.33	0.03	0.30
1.35	0.40	0.10	0.30
1.38	0.39	0.08	0.31
1.29	0.35	0.04	0.31
1.38	0.35	0.03	0.32
1.42	0.48	0.16	0.32
1.30	0.40	0.18	0.32
1.43	0.38	0.06	0.32
1.25	0.35	0.03	0.32
1.46	0.44	0.12	0.32
1.33	0.36	0.04	0.32
1.24	0.36	0.03	0.33
1.34	0.45	0.12	0.33
1.35	0.43	0.10	0.33
1.35	0.45	0.10	0.35
1.32	0.38	0.03	0.35
1.33	0.38	0.03	0.35
1.43	0.45	0.10	0.35
1.38	0.42	0.04	0.38
1.53	0.49	0.10	0.39

Finally, to sum up the differences between the two species, besides the structural and more reliable characters already given, in general terms, *spretus* compared to *femur-rubrum*, may be distinguished by the following less reliable and more inconstant characters: It is the larger species; the antennæ are slightly shorter and paler; the occiput and two anterior lobes of the prothorax are more livid and darker; the third lobe of prothorax broader; the dark, subdorsal, prothoracic mark running from the eyes less pronounced; the oblique, yellow line from base of wings to base of hind thighs more often obsolete; the front wings paler toward tips, more ferruginous at base, with larger, more conspicuous spots; the anal abdominal joint of male also much paler; the cerci and valves in the female generally shorter and more robust.

Such are the distinguishing features between these two insects, when the more typical specimens of the western *spretus* are compared with *femur-rubrum* as it occurs around St. Louis. That these distinguishing features will lose their value in proportion as abundant material from all parts of the country is examined and compared, I have not the least doubt; for I have already shown that such is the fact so far as coloration and length of wing is concerned, and the meagre material which I have from the East indicates considerable variation and approach in the more important structural characters. In considering the ravages of migratory locusts in the Atlantic States, I shall recur to this subject.

CHRONOLOGICAL HISTORY.

The plague of locusts is as old, nay older, than the Bible, where, in Exodus, we are told how they went up over the land of Egypt and "covered the face of the whole earth, so that the land was darkened; and they did eat every herb of the land, and all the fruit of the trees which the hail had left; and there remained not any green thing in the trees, or in the herbs of the field, throughout all the land of Egypt."* Paulus Orosius tells us that in the year of the world 3,800, such infinite myriads of locusts were blown from the coast of Africa into the sea and drowned, that, being cast upon the shore, they emitted a stench greater than could have been produced by the carcasses of one hundred thousand men, and caused a general pestilence.† Numerous, indeed, are the accounts of general devastation, pestilence and famine that have frequently followed in the wake of these locusts in the East, and travelers in South Africa, Asia and South Europe, have left us abundant records of the fearful devastations of this "Army of the Great God," as the Arabs term these migrating hosts. Their history is one of dire calamity and desolation; and their devastations have become part of the history of nations: they have even been perpetuated in coins. Those who have the curiosity to acquaint themselves with the history of locusts in the more ancient parts of the world, cannot do better than refer to Kirby and Spence,‡ or to the compilation published in this country by Frank Cowan.* It suffices here to state that the injuries by locusts in the desert countries bordering mountain ranges in the East, are by no means matters of past history only, but that they are felt occasionally at the present time as they have been for all time past. In 1866, during the same year as our previous great invasion, Algeria and the whole country in the north of Africa, was severely visited, causing the famine of 1867, and the epidemics which followed; and even in 1874, these insects caused serious alarm in the same parts of Africa; and M. H. Brocard tells us that in the three subdivisions of Constantine, Setif and Batna, 4,820 hectolitres (about 14,000 bushels) of eggs were collected.† The species most conspicuous in its devastations, especially in Central Europe, is the Migratory Locust (*Œdipoda migratoria*, Linn), though in Africa and Asia the *Acridium perigrinum* and the *Caloptenus Italicus* have similar destructive and migratory powers. All these insects belong to the same family as our own species, and the last named, even to the same genus.

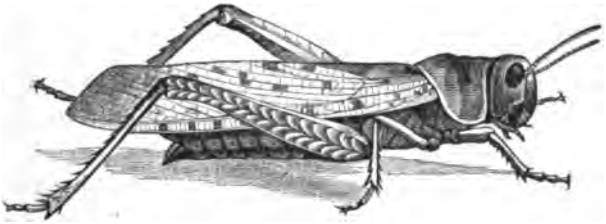
---

* Exodus, X, 15.

† Oros, *Contra Pag.* 1, V., c. 2.

‡ Introduction to Ent. I., Letter VII., London, 1828.

[Fig. 30.]



MIGRATORY LOCUST OF EUROPE.

While the chronological record of Locust invasions and devastations in the "Old World," is full and complete, the record of such invasions in our own country, has never been fully written. The most complete record that I know of, is that by Alexander S. Taylor, of Monterey, Cal., published in the Smithsonian Report for 1858, (pp. 200–213), to which I am indebted for the earlier accounts, which follow: From what is here given, it is very evident that these insects have occasionally proved great plagues from the earliest settlement of the country; and there can be no doubt that from time immemorial, or since our continent assumed its present configuration, they have from time to time played the same rôle of devastators, and that the only exceptional circumstance about the 1874 irruption, compared to those of former years, was the larger area of settled and cultivated country devastated, and the consequent greater amount of distress entailed.

---

* Curious History of Insects, pp. 101—31, Phila., 1865.

† *Comptes Rendus*, Paris Academy, Jan. 25, 1875.

The earliest record I can find of Locust injuries in America, is in Gage's West Indies, and they date back to the year 1632. In speaking of their visitation in Guatemala, he says :

> "The first year of my abiding there it pleased God to send one of the plagues of Egypt to that country, which was of Locusts, which I had never seen till then. They were after the manner of our Grasshoppers, but somewhat bigger, which did fly about in numbers so thick and infinite that they did truly cover the face of the sun, and hinder the shining forth of the beams of that bright planet. Where they lighted, either upon trees or standing corn, there was nothing expected but ruin, destruction and barrenness; for the corn they devoured, the fruits of trees they ate and consumed, and hung so thick upon the branches that with their weight they tore them from the body. The highways were so covered with them that they startled the traveling mules with their fluttering about their heads and feet. My eyes were often struck with their wings as I rode along; and much ado I had to see my way, what with a montero wherewith I was fain to cover my face, what with the flight of them which were still before my eyes. Where they lighted in the mountains and highways, there they left behind them their young ones, which were found creeping upon the ground, ready to threaten such a second year's plague, if not prevented; wherefore all the towns were called, with spades, mattocks and shovels, to dig long trenches and therein to bury the young ones."

The early Jesuit missionaries of California have left numerous records of their injuries on the Pacific Coast. Father Michael del Barco records their visitations in California in 1722, 1746 and the three succeeding years; also in 1753, 1754, and 1765. Clavigero, in his History of California, also gives a very full description of these pests.

In 1827, 1828 and 1834, they destroyed all the crops in the rancheros and missions, and in 1838 and 1846, again did great damage in upper California. "For more than half a century they have troubled the Argentine Republic in South America. In a latitude corresponding with Louisiana and Texas, but in the southern hemisphere they have made agriculture worthless, and rendered the settlement of that magnificent country between the Andes and the Atlantic Ocean, by a dense population, impossible."* Dr. B. A. Gould gives a graphic account of a swarm of locusts in 1873 that devastated Cordoba, a swarm at least twenty miles in length and six miles in breadth, extending for an altitude of 5° like a thick, black trail of smoke. † Of the ravages of locusts in the Atlantic States, I shall speak more particularly in a future chapter: We have records of great injury from locusts in New Hampshire, Massachusetts and Vermont, at several periods during the latter part of the last century.

Coming now to the chronological history of the particular Rocky Mountain species in question, anything like substantial records fail us, and in order to give the following summary of its devastations during the present century, I have had to ransack the files of hun-

---

*Rev. Edw. Fontaine, in New Orleans *Times*, March, 1866.

† Amer. Journ. of Sc. Dec. 1873.

dreds of periodicals, and to depend on a number of fugitive articles published during the last twenty years.

In 1818 and 1819, according to Neill's History of Minnesota, vast hordes of grasshoppers appeared in Minnesota, eating everything in their course; in some cases the ground being covered three or four inches thick. In the same years they were extremely injurious in the Red River country in Manitoba. In 1820, or the succeeding year, we hear of them falling upon the western counties of Missouri, as described in the following items:

"We were informed by old residents of West Missouri and some of the Indians, that long ago, I think it was in 1820, there was just such a visitation of grasshoppers as is now afflicting us. They came in the Autumn by millions, devouring every green thing, but too late to do much harm. They literally filled the earth with their eggs, and then died. The next Spring they hatched out, but *did but little harm*, and when full-fledged left for parts unknown. Other districts of country have been visited by them, but so far as I could learn, they have done but little harm after the first year."—[S. T. Kelsey, Ottawa, (now of Hutchinson,) Kansas, in *Prairie Farmer*, June 15, 1867, p. 395.

A Missouri paper publishes a statement by an old settler, that great numbers of grasshoppers appeared in September, 1820, doing much damage. The next Spring they hatched out, *destroying the cotton, flax, hemp, wheat and tobacco crops;* but the corn escaped uninjured. About the middle of June they all disappeared, flying off in a southeast direction.—*Western Rural*, 1867.

It is reasonable to suppose that these 1820 swarms also ravaged Kansas and the country to the northwest, very much as they did in 1874, though no records of the fact are to be found, for the simple reason that the western country was unsettled by farmers. We know that the crops were destroyed in many parts of Manitoba during the same and the previous year, and the migrations of 1819 and 1820 must have been very similar to those of 1873 and 1874.

In 1845 and again in 1849, we have accounts, from various sources, of their swarming in Texas. In 1855 there was another very general irruption all over the western part of the continent. Says Mr. Taylor, in the Smithsonian Report already alluded to: "Up to the 11th of October, 1855, and commencing about the middle of May, these insects extended themselves over a space of the earth's surface much greater than has ever before been noted. They covered the entire Territories of Washington and Oregon, and every valley of the State of California, ranging from the Pacific Ocean to the eastern base of the Sierra Nevada; the entire Territories of Utah and New Mexico; the immense grassy prairies lying on the eastern slopes of the Rocky Mountains; the dry mountain valleys of the republic of Mexico, and the countries of Lower California and Central America; and also, those portions of the State of Texas which resemble, in physical charactertstics, Utah and California. The records prove that the locusts extended themselves, in one year, over a surface comprised within thirty-eight degrees of latitude, and, in the broadest part, eighteen degrees of longitude.

"On several days in June, July and August, of 1855, the grasshoppers (or *langostas* of the Spaniards) were seen in such incredible numbers in the valley of Sacramento, in California; in the valley of Colima, in Southwest Mexico; in the valley of the Great Salt Lake; in Western Texas, and in certain valleys of Central America, that they filled the air like flakes of snow on a winter's day, and attacked everything green or succulent with a voracity and despatch destructive to the hopes of the agriculturalists."

They are described as reducing the Mormons of Salt Lake, during that year, to a simpler diet than that of John the Baptist, for the people had to fall back on the locusts without the honey; and they caused a good deal of suffering in the then Territories of Kansas, Nebraska and Minnesota. The Summer of 1855, like that of 1874, was exceedingly dry—the driest in fact that had been known for ten years.

In 1856 they again made their appearance in parts of Utah, California and Texas, but in diminished numbers. In Minnesota, however,* and in West and Northwest Iowa their ravages during this year seem to have been greater.

In 1857 we hear of them again in various parts of the Northwest† and around the Assiniboine settlement in Manitoba,‡ and they destroyed the entire crop of a region of country extending from the base of the third plateau to the Gulf of Mexico, 150 miles in length, and about 80 in breadth, including the entire valley of the Gaudaloupe, and much of the territory watered by the Colorado and San Antonio rivers. Throughout this whole area of 12,000 square miles every green thing cultivated by man was consumed, and how much further northwest the ravages extended is not known.‖ They reached as far East as Central Iowa.§

It is probable that part of the injury reported in 1856 and 1857 east of the Rocky Mountains was caused by the progeny from the immense swarms that swept over the country in 1855; and it is quite likely that some of them reached Missouri, for Mr. H. B. Palmer, of Hartville, has related to me how, about 1857, these insects passed through a portion of Wright county, from N. to S., stripping everything on their way.

---

* Rep. of Dept. of Agr. 1863, p. 36.

† Walsh's Ills. Ent. Rep. pp. 92-3: *Prairie Farmer*, April 25, 1868.

‡ *Canada Farmer* Aug. 15, 1874.

‖ Rev. E, Fontaine, *loc. cit.*

§ *Prairie Farmer*. April 25, 1868.

In 1860, as several Kansans have informed me, these locusts came and did much damage around Topeka, remaining a few days and leaving the last of August. This must have been a limited and rather local swarm.

In 1864 we again hear of locust invasions into Manitoba, Minnesota, and around Sioux City, Iowa, and their eggs hatched and the young did much damage the following year, 1865. In Colorado one of the most destructive visitations ever known there come in 1864 from the northwest, doing much damage, as did the progeny in 1865.

The year 1866 was another marked locust year, and the first, since that of 1855, in which the damage was sufficiently great and widespread to attract national attention. The insects swarmed over the Northwest and did great damage in Kansas, Nebraska, and North-eastern Texas, and invaded the western counties of Missouri very much as they did the past year. They came, however, about a month later than in 1874. They were often so thick that trains were seriously delayed on account of the immense numbers crushed on the track. Mr. Walsh has published a full record of this invasion in the Report already cited.*

In 1867 the progeny of those which fell upon the country the previous year did more or less damage, which was extensively reported during the early part of the growing season. Later in the season, however, fresh swarms came from the Rocky Mountain region and fell upon the fertile plains of the Mississippi Valley. Thus there were two fresh invasions, the one following the other, in the years 1866 and 1867; an occurrence which is quite exceptional, and to which the immense damage done during the latter year is, in great part, attributable. Mr. Walsh (*loc. cit.*) has given us, at great pains, a pretty full record of the doings of locusts in 1867, and from said record he makes it quite clear that the invasion of 1866 was followed in 1867 by a fresh, though less extensive one, direct from the Rocky Mountain region. I may add that a number of scraps and records of the insect's doings during those two years, other than those he has brought together, bear out his deductions. The locusts also fell upon Utah in immense swarms in 1867.

During the subsequent years of 1868 and 1869 we hear more or less of the remnants of these two vast swarms from the mountain region, and of their injury in the Mississippi Valley; but their numbers are always diminishing and their enemies increasing, so that during the latter year not a healthy individual was to be found, and in 1870 the race had about vanished from the invaded country—at least from its more eastern portions. I shall here bring together a few items and communications that will serve to continue the chronological history of the pest during these two years; confining the extracts to those cases where I have, in each instance, been able to verify, by specimens, the species referred to, as the genuine *spretus*.

---

*First Annual Rep. as Acting State Ent. of Ills., pp. 83-4 (1868).

In passing over into Kansas, the corn for a few miles was of a splendid appearance and rapidly maturing, but we soon came into the grasshopper country, where corn, by the thousands of acres, was stripped as clean as a field of bean poles, and entirely covered. The gardens had been completely denuded of all vegetables, and all that were used west of Fort Riley were carried from Leavenworth and further east. In returning through Northern Missouri, we found better prospects for all the crops; at Cameron Station we were shown stalks of corn sixteen feet high, heavily eared, as a sample ot many fields.—[H. D. Emery, in *Prairie Farmer*, Fall of 1868.

On Saturday, the 8th of August, the grasshoppers returned. During the night of the 7th, a strong wind commenced blowing from the northwest, which steadily continued during the next day. As early as nine o'clock A. M., large numbers of grasshoppers could be seen flying very high up; at about three o'clock P. M., the wind ceased to blow so strong although a good breeze was kept up. The grasshoppers commenced lighting, which they did in fearful numbers, in many places bending the tops of the corn-stalks on which they settled, and commenced their work of destruction. They are yet with us, and have already injured the corn crop, in many fields, much. All the early corn is too far advanced to receive any damage from them; but much of the corn crop is late because of the work of the grasshoppers hatched out here last Spring. This late crop will be much injured from the fact that it is just tasseling and shooting, and the pesky things appear to have a great liking for the tender silks and shucks on the ends of the just forming ears. With the silk eaten off, and the tassel much injured, fears are entertained that inferior ears will be formed. * * * —[S. H. K., Page county, Iowa, *ibid*, Aug. 10, 1868.

On Saturday, the 7th, in the afternoon, the "red-legged" locusts began "to pour into" this region of country, and they have been as industrious as "circumstances would permit." The cabbage, potato-vines, beets, onion-tops, and other vegetables were "pressed into service" in a short space of time. Some of my peaches are stripped of leaves; other trees only in part. The apple trees and Kirtland raspberry canes were denuded of their foliage; they even devoured the leaves of the walnut and other forest trees. Many of the weeds indigeneous to the country shared the same fate as the tender vegetables. The cherry and some seedlings of the wild cherry tree of Pennsylvania are exempt from their attacks. The foliage of the hickory appears to be a favorite dish with them.

The grape vine leaves have not escaped entirely, but Concord, Rebecca, Diana and some other varieties appear to be preferred to Clinton, Franklin and that more excellent Isabella, together with some other kinds. My young pears have been so far uninjured, but the trouble is that the ground in certain spots is literally covered with them. On Sunday, there were millions of them that made an effort to leave, but a Southeasterly wind prevented them, and they lit on the ground again.

They have, as yet, done very little damage to the blackberry plants. The rare kinds of this region that I am testing, such as the Missouri Mammoth, Wilson and Kittatiny, I covered with prairie hay, which being old they will not eat while there is anything green and tender. They do not appear to be devotedly attached to the Doolittle raspberry, as but few canes are yet leafless. On Sunday night we had a heavy rain, accompanied with thunder and lightning, which will prevent them from starting in large numbers this morning. They are evidently bound for the south. A great many left this forenoon for that direction. Many would rise a few rods in the air, but again return. They have denuded thousands of acres of corn in this region, but the extent of damage done at a distance from here I have not yet learned.—[A. M. Burns, Riley county, Kansas, *ibid*, Aug. 22, 1868.

We have many grasshoppers. When they are small they seem most destructive. Early in the season they stripped oats and wheat indiscriminately; now they work on the wheat principally. Some wheat-fields are entirely destroyed by them, and on other fields they are eating off all the blades and youngest shoots. They have commenced on the corn. Some few are now getting their wings. Enclosed I send you specimens. A great many were hatched out last week, and millions were killed all along by heavy rains and some few by birds, etc.—[Extract from a private letter from Uriah Bruner, Omaha, Nebraska, June 8, 1868.

Enclosed find grasshoppers. The two with strings attached have parasites on their wings, and it is asserted by many that thousands have been killed by those lice. The grasshoppers are leaving about as fast as they can fly, and some are coming from other parts. We have less now than we had some time ago. Wheat and some or most kinds of garden vegetables the grasshoppers devour as fast as they can, while prairie grass, oats, etc., though they are just as plenty on, they seem to eat a great deal less of, probably not more than is necessary to subsist them.—[Letter extract from same, June 19, 1868.

The history of these grasshoppers, as far as it relates to this part of the country, is as follows: About the last of September, 1866, they made their appearance for the first time, so far as I know, in this part of the country. They came in millions from the south, southwest and west, and were so numerous as to almost darken the sun: in other words, the heavens seemed from about ten in the morning till three in the afternoon to be filled with them. They lit, ate up cabbages, Fall wheat and nearly destroyed many meadows. They cohabited, and shortly after deposited their eggs in the ground in countless millions. In the Spring the eggs hatched, and after they had obtained the full size they rose in the air and were carried away to other parts.

In 1867 they came again and deposited their eggs in the Fall, and the specimens I send are from them. The number of eggs deposited last Fall was not as great as in the Fall of 1866.

The grasshoppers hatched here injure our Spring crops and then leave, to be followed in the Fall by others from the far West to prey upon our fall vegetation and deposit their eggs for another crop. One farmer told me a few days ago that the damage which he sustained from them last year could not have been less than $1,500. Last Fall I put in some Fall wheat which was entirely consumed by them. * * *

I am of the opinion that stirring the ground in the Fall exposed the eggs to the action of the frost and destroyed many of them, as but few were seen there this Spring. The hogs in the Spring root the ground over for their eggs and destroy many of them. * * * —[Letter extract from Stephen Blanchard, Oregon, Holt county, Missouri, July 13, 1868.

* * This morning and some portion of yesterday the wind was in the east, but this morning soon changed to the west, and we thought about 10 o'clock that it would rain, but about noon, or perhaps a little before, the wind changed to the north, and about 2 o'clock the grasshoppers began to fall about as fast as the flakes of snow fall, until the ground was *literally covered with them.*—[Letter extract from same, Aug. 10, 1868.

My corn has been quite badly injured by the "Western Locust." I have a small orchard of about 200 trees that have been greatly injured.

My trees set out this Spring (about 50) are as naked of leaves as they should be in February next. The trees set out a year ago are badly injured, and so are those set out three years ago. If you will send me by mail a little of the article which you recommend I will most gladly try it, and will give you the results. They have been coupling for increase for several days past. They are not now as numerous as they have been, and if they leave before they deposit their eggs in the ground for Spring hatching we may get rid of them.

It may be also that as it is so much earlier than heretofore when they came, that their eggs might hatch this Fall. In this case they will not do us much injury in the Spring for the reason that the Winter would kill them.—[Letter extract from same, Aug. 24, 1868.

I send you herewith, specimens of the Red-legged Locust, which frequently overruns our extreme western regions, but appeared *here* for the first time last Fall. They are quite as ruinous to us as Yankee carpet-baggers and scallawags! I will give you a brief sketch of them also—the *insect* Locusts, not the others!—[Extract from a private letter from the late Thos. Affleck, Brenham, Washington county, Texas, July 20, 1868.

Those hatched from eggs which were deposited after migrating to this country, so distant from their natural habitat, *do not copulate before their departure hence.* That you may record as a fact, general, I think, if not universal.—[Letter extract from same, Aug. 22, 1868.

In the Appendix will be found a letter from Mr. Affleck giving a more full and interesting account of his experience with this pest during 1868. That the insect was more or less injurious, in 1868, throughout the region invaded the two previous years is proved from various records of their hatching out, and their injuries around Salt Lake City, Utah, and by the fact that the Red River settlement appealed to the Canadian Government for aid, on account of their devastations during that year. They are reported as having been quite numerous in Andrew, Cedar, Clinton, Daviess, Gentry, Jackson, Nodaway in our own State, by the different correspondents who replied to my circular. They also attracted some attention in Kansas during the fore part of August, and during the preceding month in Iowa and Minnesota.*

In 1869 there were still some remnants left of the 1867 invasion. I received some from Leavenworth, Kansas, sent in a tin box, and in reaching me there was but one left, which, having eaten up the others, was master of the situation. They hatched out in countless numbers from the 20th to 24th of March, in Holt county, Mo.,† and were destructive east of Nemaha county, Kansas; but the following items from the *Prairie Farmer* "Record of the Season," will indicate how more and more impotent they became:

> Great numbers of the "Red-Legged Locust"—grasshoppers—have hatched out this Spring, but have done very little harm thus far, their ravages being almost wholly confined to the more tender garden vegetables.—[C. W. D., Saline county, Kansas, June 22, 1869.
>
> The "hateful grasshoppers" are very bad in sandy districts, and, when full fledged, they will visit every farmer, and take their portion.—[C., Denver, Col., July 6, 1869.
>
> Grasshoppers all left as soon as they could fly, and there has no new crop come in since. Apples were not injured here; peaches were, to some extent, but there will be a fair yield. Wild fruits of all kinds are abundant.—[J. W. O., Brown county, Kansas, August 16, 1869.
>
> The grasshoppers hatched out here last Spring, but did very little damage; they all left as soon as they could fly, and I hope it will be long before they pay us another visit. There is not much fruit raised here yet, but what there is is pretty good.—[W. S. S., Page county, Iowa, September 4, 1869.

The following letter, communicated to me, August 27, 1869, by S. K. Faulkner, M. D., of Whitesville, Andrew county, Missouri, will show that they were also lingering in our own State:

> I did not answer your letter requesting more specimens of the Colorado Grasshoppers with parasites, because they had left us, and now there is not one to be found. We had quite a stock of grasshopper eggs left us last Fall, which hatched, and in the timbered section and where the ground was smooth and hard, as "sod" or prairie that was plowed in the previous June, and not afterward plowed, they destroyed most of the wheat. But deep plowing in the Spring or late in Autumn puts them down, at least delayed them, and I think they never hatch.

---

* *Am. Entomologist* I, p. 74.

† W. L., in *Journal of Agr.*, St. Louis, Apr. 17, 1869.

Our own stock was bad enough, but on the 18th of June we received a large addition of flying ones from the South, which in some places took half of the corn, although they left on the 23d of June, staying less than five days. They came with a strong south wind, and while here the north wind blew, and if they were disturbed they would work a little South; but on the 23d, at 11 A. M., the south wind blew, and they rose simultaneously, and most of them left us; but our original stock not being able to fly, remained.

My experience is, that they like vegetables, in about the following order: Cabbage, turnips, dog fennel and burdock, tender apple and pear leaves, especially if close to the ground, as on young grafts. There are few nurserymen here who will set apple grafts if we have eggs in the ground. Then wheat, corn, oats—if hard, preferred; but they do most damage to oats by dropping the grain on the ground in cutting it off. They relish grapes about the same as oats; but the hydrocyanic acid in peach leaves is too much for them, and I have not seen one touched.

As I am glad to see you doing so good a work so well, if I can furnish you any information it will give me pleasure.

During this year, 1869, and the two following years, as will be seen from what is said further on under the head of "injuries by other non-migratory species," many of the common locusts of the country were unusually numerous and destructive; and the reports of their injuries must not be confounded with those of the Rocky Mountain species. Mr. Cyrus Thomas (*Am. Ent.* II, p. 82,) reports finding this species, in June, 1869, around St. Joseph, Mo. He says: "We arrived very early in the morning, and then they appeared to be somewhat torpid; yet when those in the grass were disturbed by the hogs, which were feeding upon them, they hopped about quite briskly. Swarms of them, as I was informed, had been flying over that section for a week previous to our arrival."

In 1870, what was probably this last species, swept down upon the country around Algona, Iowa, and in 1871 the progeny "hatched by myriads till after the first of June," and left about the first of July.* In parts of Utah and Colorado their injuries were also reported during this year.

In 1872 again they did some harm in parts of Kansas, for Mr. Albert Cooper, of Beloit, Kans., wrote me (September 1, 1872): "They came down upon us a few days ago, and are now eating up everything green." Mr. J. D. Putnam, who spent the Summer of 1872 in the Rocky Mountains, also wrote me "that *spretus* was quite numerous in the valley of the Troublesome River."

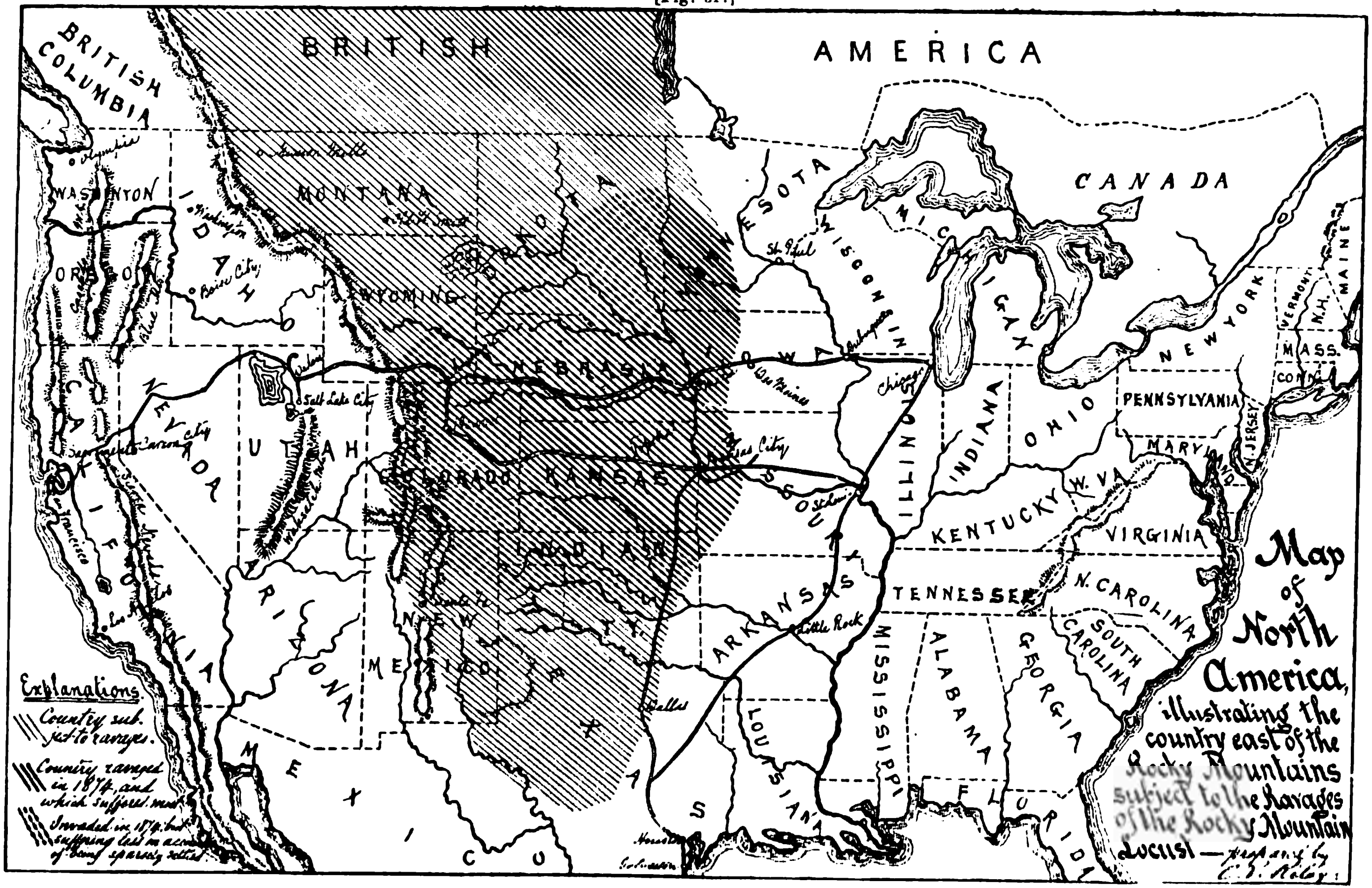
THE INVASION OF 1873.

During the years of 1873 and 1874, we have had a repetition, in a great measure, of the years 1866 and 1867. The invasion of 1873 was pretty general over a strip of country running from the northern parts of Colorado and southern parts of Wyoming, through Nebraska and Dakota, to the southwestern counties of Minnesota, and northwestern

---

* *Western Rural*, Chicago, September 26, 1874.

[Fig. 81.]


Map of North America, illustrating the country east of the Rocky Mountains subject to the Ravages of the Rocky Mountain Locust — prepared by C. V. Riley.
Explanations.
Country subject to ravages.
Country ravaged in 1874, and which suffered most.
Invaded in 1874, but suffering less on account of being sparsely settled.
BRITISH AMERICA
CANADA
BRITISH COLUMBIA
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
ARIZONA
COLORADO
NEW MEXICO
NEBRASKA
KANSAS
INDIAN TY.
TEXAS
MEXICO
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
MICHIGAN
ILLINOIS
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
N. CAROLINA
VIRGINIA
W. VA.
MARYLAND
PENNSYLVANIA
N. JERSEY
NEW YORK
CONN.
MASS.
VERMONT
N.H.
MAINE
St. Paul
Dubuque
Chicago
Des Moines
Kansas City
St. Louis
Little Rock
Dallas
Houston
Galveston
Salt Lake City
Carson City
Sacramento
San Francisco
Los Angeles
Boise City
Olympia
Blue Mts.
Sierra Nevada
Wahsatch Mts.
Great Falls

counties of Iowa—the injury being most felt in the last two more thickly settled States. The insects poured in upon this country during the Summer and laid their eggs in all the more eastern portions reached. The cry of distress that went up from the afflicted people of Minnesota in the Fall of that year is still fresh in mind, and the pioneers of West Iowa had to suffer, in addition to the locust devastations, severe damage from a terrific tornado. Great ravages were also committed by locusts in Southern California during the same year.

THE INVASION OF 1874.

We now come to the Locust visitation of 1874, which will long be remembered as more disastrous, and as causing more distress and destitution than any of its predecessors. The calamity was national in its character, and the suffering in the ravaged districts would have been great, and death and famine the consequence, had it not been for the sympathy of the whole country and the energetic measures taken to relieve the afflicted people—a sympathy begetting a generosity which proved equal to the occasion, as it did in the case of the great Chicago fire, and which will ever redound to the glory of our free Republic, and of our Union.

From a very large number of data, culled from every available source, I have prepared the accompanying map, which will at a glance illustrate the country liable to be overrun by this Rocky Mountain scourge, and more especially the territory in the United States east of the mountains, visited in 1874. This last will be seen to embrace the entire States of Colorado, Nebraska and Kansas, and portions of Wyoming, Dakota, Minnesota, Iowa, Missouri, New Mexico, Indian Territory and Texas. The heavy, dark lines indicate the area over which the greatest injury was done; the dotted lines the area which suffered less, because more sparsely inhabited; and the fine lines the area which was more or less overrun by them. The insects were doubtless as numerous in the northwestern parts of Wyoming and Dakota, and in Montana, for, in fact, they breed there; but the country is for the most part so barren and so thinly settled that the reports are very meagre. The damage inflicted in this territory cannot fall far short of fifty millions dollars. That much of the damage resulted from the progeny of the swarms of 1873, which, hatching in the country already indicated, as invaded during that year, ravaged the crops of the country where they hatched, and eventually spread to the southeast, the records abundantly prove; but there was likewise a fresh invasion direct from the mountain region, which added to that of 1873, rendered the year 1874 so memorable.

In order to present a more intelligible account of this 1874 invasion, it will be best to treat it briefly in connection with each State and Territory which suffered from it.

From New Mexico, Texas and Indian Territory the reports that have come to my notice are meagre; yet they are sufficient, in connection with those published by the Department of Agriculture, to show that the territory indicated in my map was more or less visited. In Texas, they were more particularly injurious in Cooke, Belknap, Blanco, Blandera, DeWitt, Palo Pinto, Gillespie, Medina, Kendall, and San Sabo counties.

Missouri—Fully aware of the importance of a complete and reliable record of the Locust invasion of our own State, not only as a matter of history, but as a guide for the future, I have taken some pains to make the record as complete as possible. In order to do so, I sent out the following questions to correspondents in each county—the same, in fact, to whom I addressed the Chinch Bug circular:

1. Did the Locust appear at all in your locality or in your county the past Summer or Fall?

2. If so, give the exact date at which they first appeared, and, as near as may be, the direction from which they came, and the direction and force of the wind at the time.

3. State, as near as may be, the prevailing direction in which they flew or traveled, and whether the direction was much altered or influenced by the winds. Also, whether different swarms came at different times from different directions.

4. How long did they stay?

5. What plants or crops were most injured by them?

6. What plants or crops more particularly escaped their ravages?

7. Did the locusts lay eggs; and if so, what positions did they prefer, as sward, stubble, roadways, ploughed, high or low ground, etc.?

8. Were any of the eggs noticed to hatch during the protracted and mild Fall weather?

9. What are your recollections of former visitations, with reference to these questions? And what has been the damage resulting the succeeding year of such visitations, from the young hatched on the ground?

10. Give an estimate of the amount of damage caused by them in your county.

11. What means have been adopted to prevent their injuries or to destroy them?

12. *State more particularly, if locusts invaded your county, the precise eastern limit which they reached.*

Being firmly of the opinion that these insects would never do any serious damage east of a line drawn, at a rough estimate, along 17° west from Washington, and knowing that we could only judge of the future by the past, I drew particular attention to the last question, as one not answerable from my own individual observation, as most of the others are. The replies to the above questions have been very full, for which fact I must again thank the gentlemen mentioned on pp. 51-2, *ante*. From these detailed reports, I have constructed the accompanying map* which indicates, 1st, the counties invaded in 1866, marked with a small cross (+); 2nd, those invaded in 1874, and the eastern limit reached, marked by ruled lines; 3d, the general direction from which the insects came, marked by the direction of the lines and by arrows. The answers to the different questions have been properly filed and arranged by counties, and will be preserved. They are too voluminous to publish, and it is sufficient here to give a summary of them, numbered to correspond with the questions.

1—This question is sufficiently answered on the map, from which it will be seen that 35 of our western counties were invaded, and that they reached farthest into the State in Benton and Pettis.

2—The general direction from which they came was from the northwest, the reports showing remarkable agreement in this respect. The greatest deviation from this course occurred in the more eastern or last counties visited, when the army became pretty well thinned out and demoralized, and flew about with less uniformity, being more governed by the wind. The dates at which they are reported from the different counties are interesting, and show that the insects advanced at an average rate of not more than three miles a day. That they travel at a far greater speed, every one who has witnessed their migrations is aware, and this low average rate is due to the fact that they fly only during the heat of the day and on certain days when the wind and weather are favorable, and to the further fact that the insects were no longer as vigorous and numerous as they had been in the country to the west. Another interesting fact is deducible from the returns, viz.: that the rate of advance was greater in the counties first invaded than those last reached—a fact indicating that the insects were getting more and more exhausted and less desirous of flight the farther east they came. They reached Holt county on the 8th of August, and all the counties on the same line, north and south, from Worth to McDonald, were reached during the latter part of the same month. They then continued to make short flights, and finally reached their extreme eastern limit toward the last of September.

3—The correspondents do not agree as to whether the wind has much influence on their flight; but the majority of the reports show that, as is the nature of the insect in other States, it only flew in dense swarms when the wind was from the northwest.

---

* Where the map does not accompany this page it will be found in front of the Volume.

4—In most of the counties invaded, the locusts stayed till frost; i. e., from their first appearance till frost, swarms came and left, so that there were almost always some of them about. In some of the last counties invaded, they were observed for only a few days, and in all, their numbers diminished more and more through natural or unnatural death, until Jack Frost vetoed the hopping and kicking of the very last stragglers.

5—On account of the long continued drouth, and the ravages of the Chinch Bug, but little green food was left for the locusts to destroy. This, however, they took, showing no mercy. Corn was already too hard in most of the invaded counties to be damaged; but they stripped every green blade, and often the husks, when not already killed by the Chich Bug. Fall wheat and rye were eaten as fast as they came out of the ground, and the sowing of these grains was delayed on that account. Oats were taken, but as a rule only after wheat and rye. Clover and timothy shared the same fate, and, in fact all the grasses suffered. Most garden vegetables were destroyed. The tops of peanuts, buckwheat and beans were also to their taste, and they were particularly partial to hemp. Apple, pear and peach leaves were not amiss, and the green peaches were devoured, with the exception of the stones which were left hanging to the trees. Green apples were refused. Grapes were cut off from the vines, but not eaten. Tobacco was eaten in many instances, but they did not seem to enjoy it.

6—It is well known that these omnivorous creatures will devour almost anything when pushed from hunger; yet they have their likes and dislikes, and their conduct in Missouri, so far as regards the latter, as condensed from the reports, may be thus stated: Plants belonging to the Nightshade Family (*Solanaceæ*) generally escaped their ravages; the tops of potatoes and tomatoes were not eaten. Sweet potatoes, parsnips, castor-beans, butter-beans, carrots, celery and the tops of beets were not molested. They did no damage to broom-corn or sorghum. Tobacco was in most cases not eaten, and if eaten, it is reported as killing the locusts. Prairie grass, wild weeds and the leaves of most forest trees were left uninjured. Plants growing in wet places, or in the shade of trees, hills, etc., mostly escaped injury.

7—In most of the counties invaded, the insects are reported as having laid eggs; and in some localities the eggs were so numerous as to whiten the surface wherever the ground was ploughed and they were exposed to the bleaching and cleansing effects of sun and rain. All the reports agree that low and moist ground was avoided.

8—In most counties, even in the northern ones, some of the earlier eggs hatched, especially those laid on hill-sides and other high ground exposed to the rays of the sun. The young hoppers attained a size of ¼ to ½ of an inch, and were active during the middle of the day, even into December. These young hoppers disappear and seek Winter shelter; but it is doubtful whether many, if any, survive the Winter.

9—From the accounts received in answer to this question, it appears that in 1866 the locusts invaded pretty much the same counties, the farthest point reached to the eastward being the western portion of Benton county. As the map indicates, they reached somewhat further east in the northern part of the State than in 1874, but not so far in the southern counties, there being none recorded in Polk and Lawrence. Yet imaginary lines, indicating the average eastern limits of their advance in either year would run a little to the east of Warrensburg and Clinton in Johnson and Henry counties, and not more than a dozen miles apart. They came a month later in 1873 than in 1874, and were moving from about the first of September to the end of October. The direction of their flight and progress was precisely as the past year, i. e., from the northwest. They deposited large numbers of eggs which—for the most part—hatched in the Spring of 1867. The young hoppers did much damage in many localities in the Spring of this year, destroying the wheat, corn, grasses and vegetables by stripping off the leaves and leaving only the bare stalk standing. They also attacked the oats, biting the stalks and causing the grain to drop. They fed in large bodies, traveling together, and thus devastating the crops in strips and sections, leaving the intermediate fields untouched. But taking the reports of all the counties, comparatively little damage was done by these young hoppers—much less than was anticipated and seemingly warranted by the large numbers which hatched. They were attacked by parasites and diminished rapidly in numbers; and those which acquired wings, in the early part of July, generally left their place of birth, flying in all directions, but principally in the opposite direction to that in which they had come the previous Fall. They laid no eggs and were gradually lost sight of the latter part of the growing season.

10—The insects came too late last year to do very great injury. Everything green had about disappeared on account of the continued drouth and Chinch Bug. Wheat had been harvested and was therefore uninjured; corn was too dry and hard to suit their taste. The damage was chiefly done to the young wheat, which they made a clean sweep of in many localities—chiefly in the southern counties, where it was already sown. Pastures were injured so as to oblige very early feeding of stock. The principal damage was done to garden truck, and tender trees and shrubs; and compared to the injury of the Chinch Bug the aggregate damage by locusts was slight; while some of my correspondents considered these last a benefit on account of the abundant and fattening food they supplied to poultry and hogs.

11—With the exception of Fall plowing and collecting and feeding the insects to hogs, no remedies or attempts to destroy the pests are reported.

12—The answers to this question are summed up on the map.

Kansas—While the injuries caused by the invasion of 1874 was comparitively slight in Missouri it was very great in Kansas. The locusts swept down upon that State in overwhelming hordes from the plains of Colorado on the west, and the fields of Nebraska on the north, in many instances clearing off all traces of vegetation in a few hours. The corn crop, not being as advanced as it was in our own State upon their advent, was ruined by them. I have newspaper and private reports of the appearance of the insects in all the counties, except Clarke, Comanche, Gove, Doniphan, Graham, Greenwood, Harper, Hodgeman, Kiowa, Neosho, Ness, Pratt, Sumner, Stafford, Trego and Wallace. Most of these counties are yet unorganized and do not exist, except upon the maps, the population being very limited and of a transient character. They were undoubtedly overrun like the rest, for Mr. Chas. S. Davis, of Junction City, who sent out postal-card queries over the State, informs me that he has reports from Doniphan, Comanche, Greenwood, Neosho and Sumner; and Mr. Alfred Gray, who has published full returns in his excellent report for 1874, as Secretary of the State Board of Agriculture, informs me that no county was free from visitation. He writes: "I have consulted with several reliable gentlemen concerning the appearance in the unorganized portion of the State, and find that the visitation was general. The representative from Ford county, Mr. Wright, says that south of his locality, in the Indian Territory, they appeared in immense clouds and would dip down at long intervals, and would as suddenly leave."

From the monthly returns published by Mr. Gray, it appears that 34 counties reported products enough to enable them to bridge over the Winter. Thirty counties reported 1,842 families, aggregating 9,154 persons reduced to destitution. The press of the country has been full of accounts of the destitution and suffering which this visitation entailed on the people of our sister State, and the agents of relief societies have appealed with effect to the generosity of the people throughout the land. The accounts of the suffering and distress have been very conflicting, and the truth doubtless lies between the heart-rending, sensational compositions, and those which, prompted by State pride or real estate interest, go to the other extreme, and underate the real distress. The following from Mr. Gray's Report, undoubtedly gives a calm and truthful statement:

> About the 25th of July one of those periodical, calamitous visitations to which the trans-Mississippi States are liable once in from eight to ten years, made its appearance in northern and northwestern Kansas—the Grasshopper or Locust. The air was filled and the fields and trees were completely covered with these voracious trespassers. At one time the total destruction of every green thing seemed imminent. Their course was in a southerly and southeasterly direction, and before the close of August the swarming hosts were enveloping the whole State. The visitation was so sudden that the people of the State became panic-stricken. In the western counties—where immigration for the last two years had been very heavy, and where the chief dependence of new settlers was corn, potatoes and garden vegetables—the calamity fell with terrible force. Starvation or emigration seemed inevitable unless aid should be furnished.

Again, Gov. Osborne says in his message to the Legislature, convened in extra session by special proclamation to take action regarding the suffering:

> Since issuing my proclamation convening the Legislature, an extensive correspondence has been carried on with the people, especially in the western counties, and every effort has been made by the executive office, as well as by the officers of the State Board of Agriculture, to obtain reliable statistics in regard to the condition of the people. The result of this inquiry shows that while Kansas as a State has an abundance of breadstuffs—much more than is needed to feed all her people—that that portion of the State which has been almost entirely populated during the past eighteen months, will suffer for want of the necessities of life unless provision is made for its relief.
>
> From information now in my possession, it appears that the sections of the State for which relief should be provided by legislation are confined to the counties west of the sixth principal meridian. The counties most seriously affected, and for which the needed relief cannot be afforded by the local authorities, are Norton, Rooks, Ellis, Russell, Osborne, Phillips, Smith, McPherson, Rice, Barton, Reno, Barbour, Edwards and Pawnee; while the counties of Harvey, Jewell, Ellsworth, Sedgwick, Sumner, and possibly some others, may require more or less assistance. Of these, the greatest destitution seems to prevail in the extreme northwest, embracing Norton, Phillips, Rooks, Osborne and Smith counties, and the unorganized counties lying west, where immediate aid seems necessary.

At the special session, townships in the destitute counties were authorized to issue bonds to the amount of $50,000, but the act was subsequently declared unconstitutional by the Attorney-General, so that no bonds can be sold. This source of relief was therefore of no avail, and the regular Legislature was subsequently strongly petitioned and urged to afford relief by direct appropriation. Its action will ever redound to its discredit and to that of the State. After the whole country had, by sanction of its authorities, been canvassed and importuned for aid and relief, it was still evident as Spring approached that much assistance was needed in the frontier counties, and that, without such assistance, the farmers in many counties would be unable to obtain seed to put in their crops or to carry on their legitimate farm operations. Yet in face of the constant appeals from thousands of sufferers, supplemented by two special messages from the Governor, in one of which he says: "I tremble to anticipate the judgment of mankind upon a commonwealth which, having encouraged appeals to the charity of the people of the whole country, steadfastly refuses to relieve a single want at the expense of its own treasury"—the Legislature finally adjourned without making any appropriation whatever. Yet there was abundant means in the treasury and the appropriations made for other purposes exceed half a million dollars. The ill repute which this neglect of her Legislature in the hour of need will bring upon the State will stick to her like the shirt of Nessus.

The following extracts from my private correspondence will indicate the periods at which the insects reached different parts of the State:

My interest in the cause in which you labor is my excuse for addressing you at this time. By virtue of your office you are public property, and the people of Kansas feel as if you belonged to us as well as Missouri. The main subject upon which I wish to write you is the "grasshoppers." Swarms of grasshoppers have been appearing in different parts of the State since the 15th of July. It is only within ten days that they have appeared in this immediate vicinity, and from what observation I have been able to make I cannot see that they have laid any eggs yet. They eat as voraciously as any I ever heard of. But for this fact, I would think they might be a brood hatched somewhere on the plains between here and the mountains, and that they will not breed. I understand that the only method of determining the difference between the barren brood hatched in the low lands and the swarms from the mountains is in the time they make their flight. In the Spring of 1869, when I came to this place, I watched the Spring brood hatch, and they all left as early as the middle of June. * * *—[Robert Milliken, Emporia, Lyon county, Kansas, Aug. 10, 1874.

I send you by mail a specimen of the devouring host. On Sunday evening, July 26th, they came down upon us by millions and soon cleaned our corn-fields and orchards, and then stripped the trees of their foliage. One week ago the bulk of these left, and we felt relieved of our fears that they would interfere with wheat sowing; but yesterday the sky was darkened with a new installment. There is no corn left even for seed in this county, and they are ruining the orchards. I send you some twigs. Often the trunk is girdled when they are 8 inches through. Nothing comes amiss to them, though they seem to have some preference for food. Box Elder does not seem to be palatable to them, or Black Walnut, still they will eat them, and large trees are stripped of leaves. Tobacco they seem to like, and you can see bunches big as your fist fighting and struggling to get a taste of some old quid that has been thrown in the road. To attempt to give any idea of the destruction of these plagues is useless, for the general public will not believe one-half the truth, but set us down as liars.—[H. L. Jones, Salina, Saline county, Kansas, Aug. 13, 1874.

I send you a few specimens of our "hoppers." They have destroyed the entire corn crops of Central and Western Kansas and left thousands of people in absolute destitution. They have tarried with us longer this year than usual, having been detained by adverse winds from making their usual annual southerly migration. They do not usually trouble us unless stopped in their course south by currents counter to the direction of their flight.—[N. B. Truland, Cawker City, Mitchell county, Kans., Aug. 11, 1874.

On Saturday the grasshoppers came down upon us here at Ottawa. They had been for some days to the north and east of us, and on Saturday a north wind brought them. They are in and upon everything, thick as bees in swarming time. I send you some specimens. Are they *Caloptenus spretus?* I presume they are, without doubt. Yet I notice that many of them have the wing covers much less than ⅓ longer than the abdomen; but I believe all males have the little notch in the ventral segment. Will they probably remain here and deposit their eggs, or may we expect to see them move off? I have not seen any pairing yet.—[Wm. Wheeler, Ottawa, Franklin county, Kansas, Aug. 24, 1874.

As there prevails a belief that Kansas will suffer permanently from locust devastations; and as many people are deterred from migrating thither from fear of these insects, the following answer to an inquiry which I published in the New York *Tribune*, last October, may serve to measurably allay this fear.

Does the science of Entomology offer a solution to the Grasshopper question, that scourge of the trans-Missouri? I have made my arrangements to settle in Kansas or at some point in the "Far West" for the purpose of making a home, but do not relish the idea of being menaced by famine.—[Z. F. Hopkins, Jackson Co., Ill.

Just now the people of Kansas are, in many sections of that unfortunate State, greatly discouraged, and there is quite an exodus from her extensive and fertile plains, especially of the more recent settlers. Nor is the outlook encouraging, for the locusts very generally fell upon whatever in the way of food and forage had braved an unusual drouth. Yet much unnecessary alarm is manifested, and the desolation has been greatly magnified. The authorities have fully canvassed the position and find no need to ask assistance from sister States, and we may rest assured that while many of her farmers must suffer deprivation the coming Winter there will be nothing heard of the predicted famine. We should not forget that eight years ago Kansas suffered from such a locust invasion, yet the eight intervening years between the invasion of 1866 and that of the present year have been among the most propitious in her history.

The story of the Locust (*Caloptenus spretus*) is a long one, but without going into details, I can see no good reason why any one should hesitate to settle in Kansas on account of these insects. If I had any intention of settling in that State, I should choose this time of all others to do so: first, because so many of her citizens have become alarmed and are willing to sell fine homesteads at a great sacrifice; secondly, because, from the past history of these invasions, her people may reasonably expect exemption from them for a period of eight, ten, twelve or more years. Two invasions are not likely to succed each other within two years in the same territory, and this is so well understood among the Mormons, who are apt to suffer from such devastating hosts, that they are in the habit of laying in a two years' supply of provisions—never fearing that there will be any need of a three years' supply. The people in Montana, Idaho and Nevada, expect to suffer from them about once in every seven years. The same argument, also, which would deter people from settling in Kansas would deter them from settling in the western part of Iowa, in Colorado, Nebraska, Texas, Minnesota, in short, in any of the country 500 to 550 miles east of the Rocky Mountains, from British America to Mexico; for all this vast extent of country is more or less subject to locust invasions. There are, indeed, few parts of the country not subject to periodic misfortune, either from meteorological or entomological excesses.

NEBRASKA.—Next to Kansas, this State suffered most, having been entirely overrun, as the following extract from a letter from Gov. R. W. Furnas will show: "The whole of our State, from a point, say thirty miles from the Missouri river west, has been more or less affected by 'grasshoppers.' The extreme western portion of the State was entirely devastated." They came in legions from the north and northwest, and the following extracts from correspondence will sufficiently indicate the time of appearance, which was during the last of July:

This region was visited by these grasshoppers on July 21st, and after a sojourn of ten days they departed, and with them went our corn crop for 1874. For ten long days the pests fed and fattened on our immense corn crops, and the last three or four days of their stay they deposited their eggs by the million all over the plowed ground and new breaking. In some places a small fly, and also the common black ant, have been destroying the eggs. But for every one destroyed there are probably a thousand left. It was fortunate for us that they came no sooner, as the small grain here was all ripe and they did no damage to it.—[J. W. D., Fillmore, Neb., Aug. 5, 1874.

The locusts visited us about three weeks ago from the South, and stopped about ten or twelve days with us, doing a great deal of damage to corn, garden stuffs, etc.; but I think we shall get about a one-fourth crop of corn. Don't they like onions! You could see them stand upon their heads eating into these vegetables, and they left nothing but a skin outside. I noticed upon new breaking thousands of them pairing, but I think the bulk left before depositing eggs. The wheat crop and all small grain has been good; but I believe that up the Republican Valley, in the Southwest of the State, the new settlers will have a very hard Winter, on account of the locusts.—[J. W. C. White, Lincoln, Dodge county, Nebraska, August 14, 1874.

The locusts made their appearance here about the last of July, and left on the 7th of August. The wind was blowing from the Southwest at the time of their arrival, but I think there was an upper current of wind from the North, which carried the greater part of them past, not more than one in ten (apparently) coming down. The day after their arrival the wind blew from the Northeast, and at about 10 A. M. they began to leave, a few at a time, until about 12 A. M., when they arose in a cloud, and for some hours the air was full of them, some going and some coming. After they had been here for a few days, they gathered in great numbers on the new breaking for the purpose of breeding. The result of their visit to this part of Nebraska may be summed up as follows: Corn damaged to some extent; vegetables of all kinds, except potatoes, completely destroyed; apple and pear trees stripped of foliage, and the stems of the fruit eaten, so that most of it has fallen off. In some places they have eaten the peaches entirely, nothing being left on the tree but the pit.—[Wm. Dunn, Emerson, Otoe Co., Nebraska, August 20, 1874.

The locusts came more than a month ago, and after flying backward and forward for a couple of weeks, they settled down, apparently determined to stay.—[Jno. Byfield, Red Willow, Nebraska, August 21, 1874.

A "Nebraska Relief and Aid Society" was organized to provide for the destitution caused by the visitation, and through its exertions and through legislative aid all suffering was avoided. Gov. Furnas in his message to the Legislative Assembly gives the following summary of doings, after stating that the receipts by the Aid Society amounted, up to that time, to $68,080:

Our own State, like most other portions of the country at large, especially the West, has been afflicted the past season with short crops, by reason of drouth and grasshopper devastation. While the injury has been greater than from any and all causes heretofore in the history of the Territory and State, and cannot be otherwise than discouraging, particularly to the agriculturists, there is no disposition manifested to abandon any portion of the State * * * The visitation falls on the frontier counties with particular force. They must be aided or quit the country. Aided until another year's crop is produced, the foundation is laid for a prosperous future. Aside from a natural and general principle of humanity, other good and sufficient reasons exist why these people should be aided liberally and promptly. A very large proportion of those now on our extreme borders and in need, are ex-soldiers; those who responded promptly to their country's call in the late hour of peril. * * *

Our own people in the older portion of the State, not seriously affected, have contributed liberally and promptly, both in money and in kind. All the railroads in the State, as well as those leading into it, have, with commendable liberality, extended free transportation to the State Society in aid of those in need. Generals Ord, Brisbin, Dudley and Grover, of the regular army, have rendered incalculable aid and assistance, entering with a will and zeal into the work of relief. Through the instrumentality of General Ord, the Secretary of War ordered the issue of clothing to those in need. Many portions of the older States, hearing of our misfortunes, came nobly and promptly to the relief, and very liberally. The Nebraska Patrons of Husbandry have organized a State association for purposes of relief, and not only in this, but in other States, are accomplishing very much in the matter of aid. Through the efforts of our delegation in Congress, acts for the relief of our people have passed that body. Extension of time has been given homesteaders, and a cash appropriation of $30,000 has been made with which to purchase seeds the coming Spring.

IOWA—As already stated in the chronological chapter, the Rocky Mountain Locust* invaded the northwestern counties of Iowa in the Summer of 1873, and much of the injury in 1874 resulted from their progeny. Fresh swarms came, however, in 1874, and the western counties of Algona, Calhoun, Cherokee, Clay, Dickinson, Emmett, Harrison, Humboldt, Jasper, Kossuth, Lyon, O'Brien, Osceola, Palo Alto, Pocahontas, Plymouth, Sioux, Winnebago and Woodbury, suffered more or less. East of the line indicated in my map, Iowa suffered nothing from these pests, and as the drouth was less severe than in other parts of the country, and the crops good, the distress in the ravaged counties was easily relieved.

A committee appointed to investigate the extent of devastation and of suffering in 1874, made the following cheering report to the Governor:

> We have heard, in the northwestern counties, of only a single report of eggs laid by the grasshoppers, and the pests left us too early for egg deposits; and we trust and believe they have left us for many years if not forever. The vast majority of those whom the benevolence of the people aided last year, and kept upon their farms and homesteads, have raised good crops, and with good farms and smiling faces they speak of the kind hearts who aided them in their hour of need. Now, this year, we want more aid, and must have it, to assist the settlers in Kossuth, Emmett and other sections of counties. It will take a large amount of supplies to preserve homes and make homes happy and comfortable there. Let the people with their magnificent crops and great hearts, pour out of all their abundance, and save the little farms of those who are striving to keep their little homesteads for themselves, their wives and children.

MINNESOTA—As in the case of Iowa, Minnesota was visited along her western border by these insects in 1873, and she had consequently to suffer from the young of that invasion in addition to the fresh swarms that overspread very much the same territory in 1874. The counties ravaged in 1873 were thinly settled, mostly by homesteaders with little means, and the consequent suffering was therefore very great. The value of the crops destroyed in 1873 was estimated officially:

Wheat	$2,000,000
Oats	528,000
Corn	256,000
Other crops	250,000
Total	$3,034,000

---

* My friend, J. M. Shaffer, in his Report for 1873, as Secretary of the State Agricultural Society, states (p. 25) that the insect was the common Red-legged species (*femur-rubrum*); but specimens o this 1873 invasion, which he kindly sent me, are *spretus*, sure enough; and other specimens collected in 1874, and sent me by Professors Bessey and McAfee, of the Iowa Agricultural College, tell the same tale.

The young from the 1873 invasion destroyed most of the small grain and acquired wings, and began to leave the country in June. During the month of July, and more particularly during the first half, new clouds came from Dakota and British America and swept over very much the same counties overrun the previous year, reaching a little farther east. The clouds which came in 1874 are described as reaching 100 miles east and west and 200 miles north and south.

The Commissioner of Statistics, in his report for 1874, says that the locusts destroyed more than 50 per cent. of the crops that year in the counties of Brown, Clay, Cottonwood, Jackson, Lacquiparle, Lincoln, Lyon, Martin, Murray, Nobles, Redwood, Renville, Rock, Watonwan and Yellow Medicine; and a smaller percentage in Blue Earth, Chippewa, Faribault, Grant, Nicollet, Otter Tail, Sibley, Stevens, Swift and Wilkins.

Gov. C. K. Davis wrote to the Secretary of the War Department, about the middle of July, as follows:

> The locusts have devoured every kind of crop in the northwestern part of Minnesota. (They did the same thing last year in the same area). Many thousands are now suffering for food, and I am using every public and private source to send immediate supplies of food. This State is entitled to two years quota of arms, estimated at $8,160. I respectfully request to turn over to me, instead of arms, a quantity of rations, equivalent in value.

COLORADO—The whole of Colorado east of the mountains was more or less overrun by this insect in 1874, and great damage was reported from Conejos, El Paso, Larimer, Weld, Cache a la Poudre, from Denver to Middle Park, and in the Ralston and Clear Creek regions. In the Platte Valley they did less harm. Mr. J. D. Putnam, one of my correspondents, wrote:

> The grasshoppers (*Caloptenus spretus*) have been quite destructive in this territory this year. They put in their first appearance at Valmont, Boulder county, on July 11, though I saw them on Gold Hill (in the Mts.) on July 8. The first lot remained several days and went off, but it was soon followed by another lot, and so they seemed to keep on coming. The wheat was nearly ready for harvest when they first came, consequently there is not the destitution among the farmers that there is in Nebraska.

Mr. O. A. Whittemore, Secretary of the Colorado Industrial Association, wrote:

> Our visitation this year came from the North and West. The first invasion crossed the mountains much to the north of us and coming down along the base of the mountains, and after doing much damage, leaving for the South. A late swarm came across the mountains directly west of us, and when leaving, seemed to be going South.

As this insect breeds in most of the western, mountainous part of Colorado, this State suffers more or less from its injuries every year. The insect is, in fact, the greatest pest to Colorado agriculture. Yet it is only when fresh swarms sweep through the mountain passes and canyons in darkening clouds, or when they bear down in multitudes from the plains to the northwest as they did last year, that they are considered an unavoidable calamity. As a rule these fresh accretions come so early in the season as to pass on to the south or southwest without laying eggs; but very often they come late enough to lay their eggs—the progeny from which is much more to be dreaded than with us, because it is more healthful and vigorous and does much more damage.

DAKOTA.—This Territory was also overrun in 1873 as well as 1874. From the meagre data at my disposal, the settled portions were almost completely ravaged, and in the southeastern half scarcely a wheat-field escaped destruction. The late lamented M. L. Dunlap, in his "Rural" correspondence to the Chicago *Tribune*, gives the following picture of affairs in D. T.:

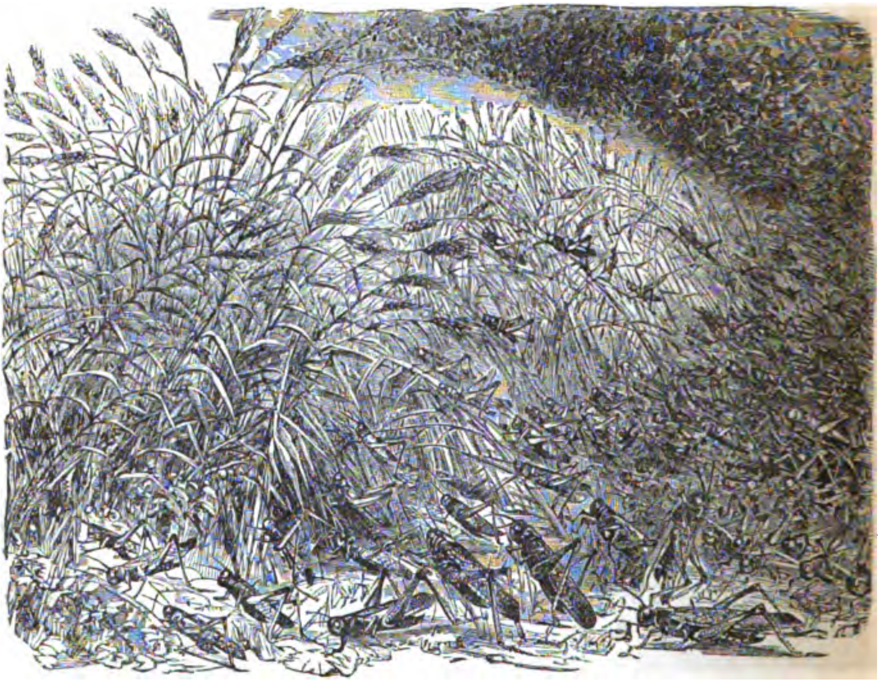
> The Grasshopper has proven a burden, and the sound of the grinding is low, and the emigrant wagon with its white cover is traveling East instead of West. A letter before me from Dakota says: "If the grasshoppers scourge us another year, Dakota will become desolate, and be remanded to her ancient solitude. This is the fourth year of bad crops, and almost every farmer has a mortgage on his goods and chattels, to tide them over the past. Many have left, not to return, and others are to come back in the Spring. At the best, the outlook is blue with despair." This will turn back an army of laborers; for all those people, when they turn back, will need work, and this they should have, if possible. These people are returning from an immense belt of country, and the vanguard is already here, with the main army to follow. A little marauding insect, born of the mountains, has driven them back, and may hold the country for a long time. The pleasant dreams of the homesteader have been brought to a close, and unpleasant images have usurped the place. Even without the grasshoppers, pioneer life is a great struggle that none can fully appreciate until they have passed its exacting ordeal.

From Montana and Wyoming, where these insects are at home, and where, from the nature of the country, settlements are very sparse and agriculture scarcely has an existence, the reports of injury are meagre.

MANITOBA.—Their injuries in 1874 were severely felt in Manitoba. The shores of Manitoba Lake were reported as at one time strewn three feet thick with their dead carcasses, where they had been driven into the lake and cast ashore; while in the South, from Pembina to Stinking River, at Palestine, Boyne Settlement, Portage la Prairie, Rat Creek, Rockwood and Winnepeg, they were reported as utterly destroying oats, barley and other crops. From Mr. Geo. M. Dawson, of McGill College, Montreal, who, as Geologist and Naturalist of the N. A. Boundary Commission, has been collecting information as to the limits of the insect in this province, I learn that the usual eastern limit is formed by the edge of the wooded country, which crosses the forty-ninth parallel about lon. 96° 30′, and runs thence to the south end of Lake Winnepeg. A line drawn from Fort Garry to the forks of the Saskatchewan river; thence to Fort Edmonton, and thence to the intersection of the Rocky Mountains and forty-ninth parallel; gives approximately the limit of the open prairie country. Over the whole area to the south of this line, the Locust is, he believes, frequently found in swarms. Mr. Dawson also informs me that they have been known to reach, in years past, a number of miles into the wooded country, as far east as the Lake of the Woods; or in other words, to about the same limit line that they reach in Missouri.

ITS FLIGHT AND RAVAGES.

[Fig. 32.]



A swarm of Locusts falling upon and devouring a wheat-field.

The voracity of these insects can hardly be imagined by those who have not witnessed them, in solid phalanx, falling upon a cornfield and converting, in a few hours, the green and promising acres into a desolate stretch of bare, spindling stalks and stubs. Covering each hill by hundreds; scrambling from row to row like a lot of young famished pigs let out to their trough; insignificant individually, but mighty collectively—they sweep clean a field quicker than would a whole herd of hungry steers. Imagine hundreds of square miles covered with such a ravenous horde, and you can get some realization of the picture presented last year in many parts of Kansas.

Their flight may be likened to an immense snow storm, extending from the ground to a height at which our visual organs perceive them only as minute, darting scintillations—leaving the imagination to picture them indefinite distances beyond. "When on the highest peaks of the snowy range, fourteen or fifteen thousand feet above the sea, I have seen them filling the air as much higher as they could be distinguished with a good field glass."* It is a vast cloud of animated specks, glittering against the sun. On the horizon they often appear as a dust tornado, riding up on the wind like an ominous hail storm, eddying and whirling about like the wild dead leaves in an Autumn storm, and finally sweeping up to and past you, with a power that is irresistible. They move mainly with the wind and when there is no wind they whirl about in the air like swarming bees. If a passing swarm suddenly meets with a change in the atmosphere, "such as the approach of a thunder-storm, or gale of wind, they come down precipitately, seeming to fold their wings, and fall by the force of gravity, thousands being killed by the fall, if it is upon stone or other hard surface."† In alighting, they circle in myriads about you, beating against everything animate or inanimate; driving into open doors and windows; heaping about your feet and around your buildings; their jaws constantly at work biting and testing all things in seeking what they can devour. In the midst of the incessant buzz and noise which such a flight produces; in face of the unavoidable destruction everywhere going on, one is bewildered and awed at the collective power of the ravaging host, which calls to mind so forcibly the plagues of Egypt.

The noise their myriad jaws make when engaged in their work of destruction, can be realized by any one who has "fought" a prairie fire, or heard the flames passing along before a brisk wind: the low crackling and rasping—the general effect of the two sounds, are very similar. Southy, in his Thalaba,‡ most graphically pictures this noise produced by the flight and approach of locusts:

"Onward they come, a dark, continuous cloud
Of congregated myriads numberless,
The rushing of whose wings was as the sound
Of a broad river headlong in its course
Plunged from a mountain summit, or the roar
Of a wild ocean in the Autumn storm,
Shattering its billows on a shore of rocks!"

Nothing, however, can surpass the prophet Joel's account of the appearance and ravages of these insects. Omitting the figurative parts, it is accurate and graphic beyond measure:

---

* Wm. N. Byers, *Am. Entomologist*, I. p. 91.

† Wm. N. Byers, Hayden's Geol. Surv., 1870, p. 282.

‡ I., 169.

"A day of darkness and of gloominess, a day of clouds and of thick darkness, as the morning spread upon the mountains; a great people and a strong; there hath not been ever the like, neither shall be any more after it, even to the years of many generations. A fire devoureth before them; and behind them a flame burneth; the land is as the garden of Eden before them, and behind them a desolate wilderness; yea, and nothing shall escape them. The appearance of them is as the appearance of horses; and as horsemen, so shall they run. Like the noise of chariots on the tops of mountains shall they leap, like the noise of a flame of fire that devoureth the stubble, as a strong people set in battle array. Before their face the people shall be much pained: all faces shall gather blackness. They shall run like mighty men; they shall climb the wall like men of war; and they shall march every one on his ways, and they shall not break their ranks. * * * They shall run to and fro in the city; they shall run upon the wall, they shall climb up upon the houses; they shall enter in at the windows like a thief."

Those who suffered from and witnessed the vast army that cast a blight over so large a portion of our Western country last year; or who passed by rail, during the better part of two days, through a perfect storm of these insects, which frequently impeded or stopped the train by their crushed bodies reducing the traction—will concede that Joel's picture is not overdrawn, and that, though written over 2,500 years ago, it might have been inspired from many parts of North America in the year 1874. The illustration (Fig. 32) which I give herewith, is reduced from one published last August in the *Scientific American*, and, though not accurate in structural detail, conveys a very good idea of the appearance of a swarm invading a wheat-field.

FOOD PLANTS.

The Rocky Mountain Locust may be said to be almost omnivorous. Scarcely anything comes amiss to the ravenous hosts when famished. They will feed upon the dry bark of trees or the dry lint of seasoned fence planks; and upon dry leaves, paper, cotton and woolen fabrics. They have been seen literally covering the backs of sheep, eating the wool; and whenever one of their own kind is weak or disabled, from cause whatsoever, they go for him or her with cannibalistic ferocity, and soon finish the struggling and kicking unfortunate. They do not refuse even dead animals, but have been seen feast-ing on dead bats and birds. Few things, therefore, come amiss to them. Yet where food is abundant they are fastidious and much prefer acid, bitter or peppery food to that which is sweet. The following resume of my notes and observations may prove interesting: Vegetables and cereals are their main stay. Turnips, rutabagas, carrots, cabbage, kohlrabi and radishes are all devoured with avidity; beets and potatoes with less relish, though frequently nothing but a few stalk-stubs of the latter are left, and sometimes the tubers in the ground do not escape. Onions they are very partial to, seldom leaving anything but the outer rind. Of leguminous plants the pods are preferred to the leaves, which are often passed by. Cucurbitaceous plants also suffer most in the fruit. In the matter of tobacco their tastes are cultivated and they seem to relish an old quid or an old cigar more than the green leaf. Tomatoes and sweet potatoes are not touched so long as other food is to mouth.

Of cereals, corn is their favorite; if young and tender, everything is devoured to the ground; if older and drier, the stalks are mostly left; the silk is, however, the first part to go. All other cereals are to their taste, except sorghum and broom corn, which are often left untouched. They are fond of buckwheat and flax, but seldom touch castor beans.

Next to vegetables and cereals, they relish the leaves of fruit trees; they strip apple and sweet cherry trees, leaving nothing but the fruit hanging on the bare twigs. The leaves of the peach are generally left untouched, but the flesh of the unripe fruit is eaten to the stone. Pear trees, as Mr. Gale informs me, suffered less than any other kind of orchard tree at the Experimental farm at Manhattan, Kansas. The tender bark of twig and branch and trunk of all these trees is gnawed and girdled, and these girdled trees present a sad picture as one passes through the ravaged country during the subsequent Winter. Sour cherry, apricot and plum trees are less affected by them, while ripe fruit is seldom touched.

Of berries, strawberries and blackberries are devoured where raspberries are frequently unmolested. Flowering shrubs very generally suffer, and they are particularly fond of Rose and Lilac. Of herbaceous plants, Helianthus, Amaranthus and Xanthium are eaten with especial avidity. Grape vines suffer more from the girdling of the fruit stems than from defoliation. Forest and shade trees suffer in different degrees, and some, when young, are not unfrequently killed outright.

Last year, Honey Locust, Red Cedar, Box Elder, Osage Orange, Elm and Oak, were either untouched or but little injured, while the following trees were preferred in the order of their naming: Ash, Willow, Cottonwood, Balm of Gilead, Silver-leaved and Lombardy poplars, Black Ash, Black Locust, Black Walnut, Hickory, Ailanthus, Maple, Sumach and Evergeens.

In every case they show a marked preference for plants that are unhealthy or wilted.

TIME OF APPEARANCE.

In endeavoring to deduce some general conclusions respecting the time of year that the 1874 swarms reached different parts of the country, great difficulty is experienced in sifting those accounts which refer to the progeny of the 1873 invasion, and the new comers which hatched within the insect's native range. Yet we shall find, as a rule, that the insects which hatch outside the native habitat—i. e., in Minnesota, Iowa, Missouri, and the larger part of Nebraska and Kansas—acquire wings and leave before the new swarms appear. In the more northerly of the States, as in Minnesota, the insects hatched on the ground acquire wings in June, and earlier in proportion as we go south, until in Texas they become fledged in April. The time of appearance of the new swarms is in inverse ratio; i. e., earlier in the more northern, later in the more southern States. Thus, while on the confines of the insect's native habitat, it is almost if not quite impossible to distinguish between the old and the new comers, in respect to the time of their acquiring wings; the difference in this respect becomes greater the farther south and east we go. The 1874 swarms appeared during June in Southern Dakota, during July in Colorado, Nebraska and Minnesota; during the latter part of this month in Iowa and Western Kansas. During August, they came into Southeast Kansas and Missouri; and by the middle of October they reached Dallas, in Texas.

One noticeable feature of the invasion was the greater rapidity with which the insects spread in the earlier part of the season, while in fullest vigor, and the reduction in the average rate of progress the farther east and south they went. The length of their stay depends much on circumstances. Early in the Summer, when they first began to pour down on the more fertile country, they seldom remained more than two or three days, whereas, later in the season, they stayed much longer. In speaking of the advent and departure of these insects, I use relative language only. The first comers, when—after having devoured everything palatable—they take wing away, almost always leave a scattering rear-guard behind, and are generally followed by new swarms; and a country once visited presents for weeks the spectacle of the insects gradually rising in the air between the hours of 9 or 10 A. M. and 3 P. M., and being carried away by the wind, while others are constantly dropping.

ITS NATIVE HOME: IT CANNOT THRIVE IN THE MISSISSIPPI VALLEY, AND CAN NEVER REACH FAR INTO MISSOURI.

A full month before a single specimen of the Rocky Mountain Locust reached Missouri in 1874, I prophesied that it would come into our western counties too late to do any very serious damage, and that it would not reach beyond a given line.* To the many anxious correspondents who, fearing that the State was to be overrun, as Kansas was being overrun, wrote for my opinion and advice, I replied "Judging of the future by the past, the farmers of Missouri, east of the extreme western tier of counties need fear nothing from Locust invasions. They may plant their Fall grain without hesitation, and console themselves with the reflection that they are secure from the unwelcome visitants which occasionally make their way into the counties mentioned, and especially of the northwest corner of the State. The same holds true of the farmers of Illinois and of all the country east of a line drawn, at a rough estimate, along longitude 17° West from Washington."

The detailed account already given (p. 144) of the counties in Missouri invaded in 1874, will show how subsequent events bore out my prophesy, and how the insect reached just about the limit I had given it. But, it will be asked, "Upon what do you base this conclusion, and what security have we, that at some future time the country east of the line you have indicated may not be ravaged by these plagues from the mountains?" I answer that during the whole history of the species as I have attempted to trace it in the chronological account already given, the insect never has done any damage east of the line indicated, and there is no reason to suppose that it ever will do so for the future. There must of course be some limit to its flight, as no one would be foolish enough to argue that it could, in one season, fly to England or France, or even to the Atlantic ocean; and as its flight is by law limited to one season—for the term of life allotted to it is bounded by the Spring and Autumn frosts—so its power of flight is limited. And as the historical record proves that it never has done any damage east of the line indicated, it is but logical to infer that it never will. "Because an insect can fly 550 miles, it would be ridiculous to argue that, therefore, it can fly 700 miles. We might as well claim that because a man can jump a ditch twenty feet wide, therefore he can jump another ditch which is thirty feet wide; or because a man can easily carry a young calf upon his back, therefore, if he practices daily, he will be able to carry the same animal upon his back when it has grown to be a cow."*

---

* *St. Louis Globe*, July 20, 1874.

My late friend, B. D. Walsh, who, from a number of data which he accumulated, first laid stress on this fact that the insect would in all likelihood never reach the Mississippi river, gives his reasons in the following concluding paragraph of his report as acting State Entomologist of Illinois:

> Every man—except, perhaps, some crazy Millerite—believes firmly that, in all human probability, the sun will rise in Illinois every morning for hundreds of years to come. Yet he has no other kind of evidence to justify such a belief, than I have to justify the truth of my theory, namely, that in all human probability we shall never for hundreds of years to come, be afflicted with the Hateful Grasshopper in Illinois. Both the inorganic and organic worlds are governed by certain fixed laws; and whether it be a vast fiery globe of liquid larva, revolving slowly upon its axis in the midst of the attendant worlds that have been circling around it, each in its own peculiarly prescribed path, for indefinite ages, or whether it be some infinitesimally minute insect, winging its way from the alpine heights of the Rocky Mountains over the Desert Plains of the West; we have but to ascertain by what laws each of them is governed, in order to be able to predict, in the case of each of them, what is and what is not morally certain to happen in the future.

"But why," it will again be asked, "will not the young from the eggs laid along the eastern limit you have indicated, hatch and spread further to the eastward?" Here, again, historical record serves us, and there are, in addition, certain physical facts which help to answer the question.

There is some difference of opinion as to the precise natural habitat and breeding place of these insects, but the facts all indicate that it is by nature a denizen of high altitudes, breeding in the valleys, parks and plateaus of the Rocky Mountain region of Colorado, and especially of Montana, Wyoming and British America. Prof. Cyrus Thomas, who has had an excellent opportunity of studying it—through his connection with Hayden's geological survey of the Territories—reports it as occurring from Texas to British America and from the Mississippi (more correctly speaking the line I have indicated) westward to the Sierra Nevada range. But in all this vast extent of country, and especially in the more southern latitudes, there is every reason to believe that it breeds only on the higher mountain elevations, where the atmosphere is very dry and attenuated, and the soil

---

†Am. Ent. I, p. 75.

seldom, if ever, gets soaked with moisture. Prof. Thomas found it most numerous in all stages of growth along the higher valleys and canyons of Colorado, tracing it up above the perennial snows, where the insect must have hatched, as it was found in the adolescent stage. In crossing the mountains in Colorado it often gets chilled in passing the snows, and thus perishes in immense numbers, when bears delight to feast upon it.

My own belief is that the insect is at home in the higher altitudes of Utah, Idaho, Colorado, Wyoming, Montana, Northwest Dakota and British America. It breeds in all this region, but particularly on the vast hot and dry plains and plateaus of the last named Territories and on the plains west of the mountains; its range being bounded, perhaps, on the East by that of the Buffalo grass. Mr. Wm. N. Byers, of Denver, Colorado, shows that they hatch in immense quantities in the valleys of the three forks of the Missouri river and along the Yellow Stone, and how they move on from there, when fledged, in a southeast direction at about 10 miles per day. The swarms of 1867 were traced, as he states, from their hatching grounds in West Dakota and Montana, along the east flank of the Rocky Mountains, in the valleys and plains of the Black Hills, and between them and the main Rocky Mountain range.*

In all this immense stretch of country, as is well known, there are immense tracts of barren, almost desert land, while other tracts for hundreds of miles bear only a scanty vegetation, the short buffalo grass of the more fertile prairies giving way, now to a more luxurious vegetation along the water courses, now to the sage bush and a few cacti. Another physical peculiarity is found in the fact that while the Spring on these immense plains often opens as early, even away up into British America, as it does with us in the latitude of St. Louis, yet the vegetation is often dried and actually burned out before the first of July, so that not a green thing is to be found. Our Rocky Mountain Locust, therefore, hatching out in untold myriads in the hot sandy plains, five or six thousand feet above the sea level, will often perish in immense numbers if the scant vegetation of its native home dries up before it acquires wings; but if the season is propitious and the insect becomes fledged before its food supply is exhausted, the newly acquired wings prove its salvation. It may also become periodically so prodigiously multiplied in its native breeding place that, even in favorable seasons, everything green is devoured by the time it becomes winged.

---

*See Hayden's Geol. Survey of the Territories, 1870, pp. 282-3.

In either case, prompted by that most exigent law of hunger—spurred on for very life—it rises in immense clouds in the air to seek for fresh pastures where it may stay its ravenous appetite. Borne along by the prevailing winds that sweep over these immense treeless plains from the northwest, often at the rate of 50 or 60 miles an hour, the darkening locust clouds are soon carried into the more moist and fertile country to the southeast, where, with sharpened appetites, they fall upon the crops like a plague and a blight. Many of the more feeble or of the more recently fledged perish, no doubt, on the way; but the main army succeeds, with favorable wind, in bridging over the parched country which offers no nourishment. The hotter and drier the season, and the greater the extent of the drouth, the earlier will they be prompted to migrate, and the farther will they push on to the East and South.

The comparatively sudden change from the attenuated and dry atmosphere of five to eight thousand feet or more above the sea level, to the more humid and dense atmosphere of one thousand feet above that level, does not agree with them. The first generation hatched in this low country is unhealthy, and the few that attain maturity do not breed, but become intestate and go to the dogs. At least such is the case in our own State and in the whole of the Mississippi Valley proper. As we go West or Northwest and approach nearer and nearer the insect's native home, the power to propagate itself and become localized, becomes, of course, greater and greater, until at last we reach the country where it is found perpetually. Thus in the western parts of Kansas and Nebraska the progeny from the mountain swarms may multiply to the second or even third generation, and wing their way in more local and feeble bevies to the country east and south. Yet eventually they vanish from off the face of the earth, unless fortunate enough to be carried back by favorable winds to the high and dry country where they flourish. That they often instinctively seek to return to their native haunts is proven by the fact that they are often seen flying early in the season in a northwesterly direction.* As a rule, however, the winds which saved the first comers from starvation by bearing them away from their native home, keep them and

---

*Mr. Affleck, in the letter published in the Appendix, shows that they frequently take this direction in leaving Texas. Mr. S. T. Kelsey also writes me: In the Spring of 1874, I think late in May, they passed over the same country (between Hutchinson and Dodge counties in Kansas) going north, flying high as before, and none of them alighting so far as I could see or learn. They were observed by many persons besides myself, but as they did no harm there was little said abont them. Mr. G. M. Dodge, of Glencoe, Dodge county, Neb., (*Prairie Farmer*, September 19, 1874,) also records their passing over that place in a northerly direction during the last of May—a date indicating that they must have been born in more Southern latitudes. See also Mr. Faulkner's letter, on page 141 of this Report.

heir issue to the east and south, and thus, in the end, prove their estruction. For in the Mississippi Valley they are doomed, sooner r later.

There is nothing more certain than that the insect is not autochhonous in West Missouri, Kansas, Nebraska, Iowa, or even Minnesota, nd that when forced to migrate from its native home, from the causes lready mentioned, it no longer thrives in this country.

That the native home of the species is sub-Alpine, is proved by he fact of its abounding to such an extent in British America, and of ts breeding in the higher mountain elevations, even up to the perennial snows. In fact, so high up does it breed that it often hatches so ate in the season as to be overtaken by the cold of the succeeding Winter before acquiring growth, when of course it perishes without begetting. The truly Alpine country cannot, therefore, be its native home; and those found breeding at such a height must be the progeny of others which flew from the plains, either east or west of the mountains. Physical barriers on the high mountain summits put a limit to the insect's extension and propagation, just as they do in the Mississippi Valley.

Such are my opinions, based upon my own observations in Missouri, Kansas, Nebraska and Colorado; on those of a large number of correspondents, and especially upon the experience of men like Mr. Byers and Prof. Thomas, who have given the subject particular attention. In treating of the native home of the species, I have confined myself, as in all other cases in speaking of the insect, as much as possible, to the country east of the Rocky Mountain Range: I leave to others to trace its history beyond the mountains.

Beyond the boundary line indicated in my map (Fig. 32), they did not reach in 1874, and beyond that line I do not believe they will ever do any damage. Not that they may not extend to some extent beyond that line, in years to come, or that the young, hatching in 1875, will not push beyond it; for I have numerous records to show that they have occurred as far as the western point of Lake Superior, and that they have even reached the Mississippi in parts of Iowa: but in all such instances they appeared in scattering numbers only, and did no material damage. They were the last remnants of the mighty armies from the mountains, moving and blowing about, diseased, parasitised, intestate and wasting away.

Well is it for the people of Missouri; well is it for the people of the Mississippi Valley, generally, that this insect cannot go on multiplying indefinitely in their fertile fields! Else, did it go on multiplying and thriving as the Colorado Potato-beetle has done, this whole valley would soon become a desert waste. A wise Providence has decreed that thus far it shall go, and no further.

It will surely be a source of satisfaction to the farmers east of the line indicated to feel assured against any future invasion by, or any serious injury from, an army of insects so prodigiously numerous as actually to obscure the light of the sun, and so ruinously destructive as to devour almost every green thing that grows!

WHAT INJURY MAY BE EXPECTED IN MISSOURI IN 1875?

The subject we have just been considering, brings us very naturally to the question propounded in the above heading. It is also a question of vital importance to the farmers in our western counties, and one that will be repeatedly asked this coming Spring; and as there prevails an erroneous impression that I have given it as my opinion that no damage can possibly result from the young hatching out in 1875, I will here repeat what I actually said on the subject last Autumn.

Setting aside possible but not probable injury from a new invasion, we may consider the probable injury that will result in 1875 from the progeny of those which came in 1874. The eggs which are deposited on southerly hill-sides often hatch before cold weather sets in, if the Fall is warm and protracted, while many hatch soon after the frost is out of the ground in the Spring. Yet the great bulk of them will not hatch till into April. That most of the eggs will hatch may be taken for granted unless we have very abnormal climatic conditions, and unprecedentedly wet and cold weather following a mild and thawing spell. The young issuing from these eggs will also, in all probability, do much damage, as they did in the Spring and Summer of 1867. But the actual damage cannot be foretold, as so much depends on circumstances. In 1867, in many counties of Kansas and Missouri, where the ground had been filled with eggs the previous Fall, little harm was done in the Spring—so small a percentage of the eggs came to anything and so unmercifully were the young destroyed by natural enemies. A severe frost kills the young after they have hatched, where a moderate frost does not affect them. In Missouri, if we have no weather that proves fatal to either eggs or young, considerable damage may be expected, but not as much as in the country to the West; for, as already stated, we received the more scattering remains of the vast army, and the eggs are neither as numerous, nor will they hatch as early in our territory as farther West. Following a rather mild February the March of '67 was a very severe one, the thermometer frequently indicating 18 degrees below zero, and according to Mr. W. F. Goble, of Pleasant Ridge, Kansas, who wrote an excellent account of the insect,* this severe weather caused many of the eggs to perish; and he expresses the opinion that "judging from the voraciousness of those that did appear, I doubt not Kansas would have been made a perfect desert if all had lived."

If after the young hoppers hatch we have much cold wet weather, great numbers of them will congregate in sheltered places and perish before doing serious harm; but if, on the contrary, our Spring and early Summer prove dry and hot (which is hardly to be expected after the several dry seasons lately experienced) much damage will result from these young locusts, where no effort is made to prevent it. They will ruin most garden truck, do much injury to grain, and affect plants very much in the order previously indicated under the head of "Food-plants." They will become more and more injurious as they get older, until, in about two months from the time of hatching, or about the middle of June, they will begin to acquire wings, become restless, and in all probability leave the locality where they were born, either wending their way further South or returning in the direction whence their parents came the previous year. Some bevies may even pass to the eastward of the limit line reached in 1874, and fall upon some of the counties bordering that line; but they will lay no eggs, and will in time run their course and perish from debility, disease and parasites. In 1876 the Rocky Mountain Locust will scarcely be heard of within our borders; a few remnants from Kansas or Nebraska, or from the country to the southwest, may make their presence manifest, if the year should be exceptionally favorable to their development; but, whether delayed till 1876, or even till 1877, the last one will eventually vanish from Missouri soil, and their race will no more be known among us till—perhaps within the next six or eight years; perhaps not within the next twenty—a fresh swarm wings its way to our borders from the plains along the mountain regions. There is, therefore, no danger of their overrunning the State to the east of the limit line; nor of their doing permanent injury in the counties they now occupy.

RAVAGES OF MIGRATORY LOCUSTS IN THE ATLANTIC STATES.

We have already seen how the true Rocky Mountain Locust, which rarely reaches the Mississippi, may be distinguished from the Red-legged species, which often mixes with it and is common to a much larger extent of country, and reaches to the Atlantic. We have also seen that the ravages of migratory locusts between the Mississippi and the Rocky Mountains, and probably to the Pacific, are confined to the one, long-winged species, (*spretus*). "How then," will naturally be asked, "do you account for the ravages of migratory locusts in the Atlantic States, since swarms have been known in those States to fly over the country and commit sad havoc, and since you tell us that the Red-legged species is incapable of such migrations?" This question, which has never been properly answered, I will now proceed to elucidate.

---

*Monthly Reports, Dept. Agr. 1867 p. 290.

First, as to migrating locusts doing great damage in some of the Eastern States during certain years, there can be no doubt of the fact. Harris, in his Treatise, gives an account extracted from the Travels of President Dwight, wherein they are recored as being most destructive in Vermont in 1797 and 1798, and as collecting in clouds, rising in the air and taking extensive flights—even covering persons employed in raising a church steeple, who, in such position, still saw the insects flying far above their heads. He also quotes from Williamson's History of Maine, that in 1749 and 1754 they were very numerous and voracious; that "in 1743 and 1756 they covered the whole country and threatened to devour everything green." Among the communications which I received last Fall was the following, descriptive of locust ravages in New Hampshire:

DEAR SIR: I see a note in the New York *Tribune* requesting those from the Locust regions to send you specimens of the variety. I send you a vial of them to-day by mail. They have been quite plenty in the Merrimack Valley on some farms. They have eaten all of our garden vegetables; in others they left us a small share. The small ones are the most plenty and the ones that have done the most mischief. I should like to know if they are of the same variety that infested the West.

Yours truly,

LEWIS COLBY.

BOSCAWEN, MERRIMACK Co., N. H., September 17, 1874.

The following account by Dr. U. T. True of the appearance of these insects in Cumberland county, Maine, in 1821, is so circumstantial that I give it in full, as quoted by Mr. S. H. Scudder:*

During the haying season the weather was dry and hot, and these hungry locusts stripped the leaves from the clover and herds-grass, leaving nothing but the naked stems. In consequence, the hay-crop was seriously diminished in value. So ravenous had they become that they would attack clover, eating it into shreds. Rake and pitchfork handles, made of white ash and worn to a glossy smoothness by use, would be found nibbled over by them if left within their reach.

As soon as the hay was cut and they had eaten every living thing, they removed to the adjacent crops of grain, completely stripping the leaves; climbing the naked stalks they would eat off the stems of wheat and rye just below the head, and leave them to drop to the ground. I well remember assisting in sweeping a large cord over the heads of wheat after dark, causing the insects to drop to the ground, where most of them would remain during the night. During harvest time it was my painful duty, with a younger brother, to pick up the fallen wheat heads for threshing; they amounted to several bushels.

---

* Hayden's Report on the Geological Survey of Nebraska; and "The Distribution of Insects in New Hampshire," p. 375.

Their next attack was upon the Indian corn and potatoes. They stripped the leaves and ate out the silk from the corn, so that it was rare to harvest a full ear. Among forty or fifty bushels of corn spread out in the corn-room, not an ear could be found not mottled with detached kernels.

While these insects were more than usually abundant in the town generally, it was in the field I have described that they appeared in the greatest intensity. After they had stripped everything from the field, they began to emigrate in countless numbers. They crossed the highway and attacked the vegetable garden. I remember the curious appearance of a large, flourishing bed of red onions, whose tops they first literally ate up, and not content with that, devoured the interior of the bulbs, leaving the dry external covering in place. The provident care of my mother, who covered the bed with chaff from the stable floor, did not save them, while she was complimented the next year for so successfully sowing the garden down to grass. The leaves were stripped from the apple trees. They entered the house in swarms, reminding one of the locusts of Egypt, and, as we walked, they would rise in countless numbers and fly away in clouds.

As the nights grew cooler they collected on the spruce and hemlock stumps and log fences, completely covering them, eating the moss and decomposed surface of the wood, and leaving the surface clean and new. They would perch on the west side of a stump, where they could feel the warmth of the sun, and work around to the east side in the morning as the sun reappeared. The foot-paths in the fields were literally covered with their excrements.

During the latter part of August and the first of September, when the air was still dry, and for several days in succession a high wind prevailed from the northwest, the locusts frequently rose in the air to an immense hight. By looking up at the sky in the middle of a clear day, as nearly as possible in the direction of the sun, one may descry a locust at a great hight. These insects could thus be seen in swarms, appearing like so many thistle-blows, as they expanded their wings and were borne along toward the sea before the wind; myriads of them were drowned in Casco bay, and I remember hearing that they frequently dropped on the decks of coasting vessels. Cart loads of dead bodies remained in the fields, forming in spots a tolerable coating of manure.

Mr. J. S. Smith says that he has seen "hackmatack trees almost covered with them, and entirely stripped of their leaves."*

All these accounts agree in referring the injury to the common Red-legged Locust; but as I am fully persuaded that this species, as found in Illinois and Missouri, is incapable of any extended flight,† I could not help feeling that some other species had been confounded with it, and had played the part of migratory locust in the White Mountain regions of Maine and New Hampshire. It was with satisfaction therefore that, upon examining the locusts sent me by Mr Colby, I found them to belong to a new and different species, smaller than either the Rocky Mountain or the Red-legged species, but in structure and relative length of wing much more nearly resembling the former than the latter; in other words, its relative length of wing enables it to fly with almost the same facility as its Rocky Mountain congener. This species may be called the Atlantic Migratory Locust, and is described below, in comparison with its close allies:

CALOPTENUS ATLANIS N. sp.—Length to tip of abdomen 0.70—0.85 inch; to tip of closed wings 0.92—1.05 inches. At once distinguished from *femur-rubrum* by the notched character of the anal abdominal joint in the male and by the shorter, less tapering cerci; also by the greater relative length of wings which extend, on an average, nearly one-third their length beyond the tip of the abdomen in the dried specimens; also by the larger and more distinct spots on the wings—in all which characters it much more closely resembles *spretus* than *femur-rubrum*. From *spretus*, again, it is at once distinguished by the smaller size, the more distinct separation of the dark mark running from the eyes on the prothorax and of the pale line from base of wings to hind thigh; also by the anal joint in the ♂, tapering more suddenly and by the two lobes forming the notch being less marked. From both species it is distinguished not only by its smaller size but by the deeper, more livid color of the dark parts, and the paler yellow of the light parts—the colors thus more strongly contrasting.

---

* Rep. Connecticut State Bd. of Agr. 1872, p. 363.

† I do not mean by this that it is incapable of rising in the air; but I am quite sure that as found in St. Louis county it is incapable of any such flights as *spretus* takes. In the higher parts of the country, whether east or west, the power of flight may be greater.

6 ♂'s, 7 ♀'s from New Hampshire. Just as the typical *femur-rubrum* is at once distinguished from the typical *spretus* by the characters indicated; so *Atlanis*, though structurally nearer to *spretus*, is distinguished from it at a glance by its much smaller size and darker, more marbled coloring. The contrast is all the greater in the living specimens, and I have seen no specimens of *spretus* that at all approach it in these respects.

Whether this is the *femur-rubrum* as defined by DeGeer or by Harris, it is almost impossible to decide, though Harris's figure of *femur-rubrum* better represents it than the true *femur-rubrum*, as subsequently defined by Thomas, and as found in Illinois and Missouri.

It has always been a question among orthopterists, as to whether *spretus* should really be considered specifically distinct from *femur-rubrum*, and Mr. Uhler has himself expressed to me his doubts as to the two being distinct. This indecision, which I myself very freely shared, may be attributed principally to the fact that the species just described (*Atlanis*) has very generally been mistaken for *femur-rubrum*, and that the accounts of this latter rising into the air in swarms have in reality had reference to the former species. The only reference to this longer-winged species, in the East, that I am acquainted with, is that by Dr. A. S. Packard, jr., whose reference to the occurrence of *spretus* in Maine and Massachusetts, as exhibited by specimens in the museum of the Peabody Academy of Science,* doubtless applies to *Atlanis*.

Whether these three insects, as here defined, are really distinct species, or only races of one and the same, is a question that each individual entomologist will decide for himself, according to his idea of what constitutes a species. As ordinary distinctions go, however, there can be no doubt as to their specific distinctness, notwithstanding my own conviction that they merge into each other through exceptional intermediate individuals. That they will cross with each other and produce fertile progeny, I have little doubt, and that *femur-rubrum* mixes more or less with the other two, is probable; yet *spretus* and *Atlanis* can never thus cross, for they are effectually separated by the Mississippi Valley—a fact proved alike by *spretus'* dying out on the limit line I have mapped, and by its perishing when artificially transported in the egg and hatched in the Atlantic States.*

---

* *Am. Naturalist*, VIII, p. 502. Since the above was written, Dr. Packard has submitted a rather poor and discolored specimen to me, and it is, as I inferred, what I here call *Atlanis*.

It is in this, as it is in almost every other instance where large material from widely different parts of the country is examined; the lines which are easily drawn between species characterized from single individuals, break down, and continually remind us of the arbitrary nature of specific definitions, and of the fact that most of the species, as defined among lower animals and plants, have no real existence in nature. There are races of *femur-rubrum* which approach even the larger *differentialis* as much as they approach *spretus*. In short, without speculating on the common origin, in the past, of all these species—and, indeed, of all species composing present genera—we behold, in a broad sense, a short-winged species (*femur-rubrum*) common to the whole country between the Rocky Mountains and the Atlantic, giving way, in the higher altitudes alike of the Rocky Mountain and the White Mountain, and probably of the Alleghany regions, to a longer-winged one; and the reason why the western long-winged species is more disastrous than that of the East, is doubtless due to its larger size and to the larger extent of table land in which it breeds, as well as to the fact that the western climate is more subject to excessive drouths, which cut off the supply of nourishment at a time when the insects are acquiring wings, and thus oblige them to migrate—such conditions occurring much more rarely in the home of the eastern species. The future orthopterist, as he studies material from all parts of the country, will very likely write: *Caloptenus femur-rubrum*, DeGeer., var. *spretus* Thomas, var. *Atlanis* Riley; but the broad fact will remain that these three forms—call them races, varieties, species, or what we will—are separable, and that they each have their own peculiar habits and destiny.

INJURY FROM OTHER NON-MIGRATORY LOCUSTS.

Almost every year, in some part or other of the country, we hear reports of injury by locusts. In 1868, for instance, while the Rocky Mountain species was attracting attention, as I have already stated, (p. 137), in many parts of the West, other non-migratory species were extremely injurious in the Mississippi Valley, and in the Eastern States. In Ohio they appeared in countless myriads during that year, and at the meeting of the Cincinnati Wine Growers' Society it was stated that they invaded the vineyards, destroying entire rows, defoliating the vines and sucking out the juices of the berries. In the same year I saw them in countless millions in many parts of Illinois and Missouri. They actually stripped many corn-fields in these States, and had not the crops been unusually abundant, would have caused some suffering. They were very destructive to flower and vegetable gardens.

---

* See an observation by Mr. S. S. Rathvon, of Lancaster, Pa., who concludes, from experiment, that the climate there is "unwholesome" to the species. (*Am. Entomologist*, II., p. 83.)

In 1869, they were, if anything, worse than in 1868. I remember that in the vicinity of St. Louis, in addition to their ordinary injuries, they stripped the tops of Norway Spruce, Balsam Fir and European Larch; took the blossoms off Lima beans; severed grape stems, and ate numerous holes into apples and peaches, thereby causing them to rot. They were indeed abundant all over Illinois, Missouri, Iowa and even Kentucky; but attracted no attention East.

In 1871 they were again very bad, especially East, as the following items will show:

> The grasshoppers (locusts) have been more numerous and destructive this year in Maine than perhaps ever before. This was partly owing to the dry weather, and with the advent of the rainy season we hope their career will be somewhat checked. In this county they are thick, but in some of the central portions of the State they literally swarm, devouring nearly every green thing before them. They did much injury to the grass-fields, and now that is cut, they have betaken themselves to the cultivated crops. In some cases whole fields of corn and beans have been completely stripped. Even the potatoes have not been spared.—[*Country Gentleman*, Aug. 10, 1871, speaking of Insects in Maine.

> Grasshoppers are reported to have very seriously injured the corn, grass and grain crops (and in some cases orchards and nurseries) of the counties of Androscoggin, Franklin, Knox, Kennebec, Lincoln, Oxford, Piscataquis, Penobscot, Waldo and Somerset, in Maine. So serious has been the damage that the subject was made a topic at the recent State Agricultural Convention in that State. In Androscoggin county, they injured pastures greatly and affected the condition and price of stock. Some grain-fields were protected by drawing a rope across the heads at sunset, thus brushing off the insects and preventing feeding. In Franklin county a field of twelve acres of sweet corn was only saved by keeping a man in it continually to drive out the grasshoppers. One man in York county stopped their passage to his fields by building a brush fence around them.—[*American Agriculturist*, 1871.

> These pests (the locusts) have been numerous and destructive during the past month in some portions of the Eastern States. In Sagadahoc county, Maine, the crops and pastures were injured by them very much; also in Hancock county. In Franklin many fields of grain were cut to save the crops from them and for feeding. In Oxford oats were "eaten entirely down, as clean as though fed upon by sheep." In some portions of Plymouth county, Massachusetts, they are reported to have eaten everything green. In Caledonia county, Vermont, they have been very destructive. All through Windsor they have been "a terrible scourge." In Orleans they are reported abundant, and in Windham they have done "much injury to some of the crops." In Wayne county, Pennsylvania, also, they are reported to have done much damage.—[Monthly Report Dep. of Agr. for August and September, 1871.

In 1872 they were again injurious East:

> The grasshoppers are making great havoc on the grass, grain and corn. For a space of about one and a half miles square they are destroying almost everything. Clover is trimmed up all but the head; oats-fields look like fields of rushes coming up to the hight of 16 to 18 inches without leaf or head. The leaves of wheat and their kernels are eaten out. These hoppers move back and forth two or three times a day, and whole sections are almost alive with them.—[*Mirror and Farmer*, (New Hampshire) August 10, 1872.

Even in 1874 much injury by them was reported in the Mississippi Valley and eastward, and a few extracts will suffice to indicate how numerous they often were:

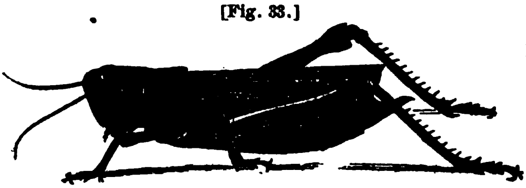
> The grasshoppers destroyed four acres of my wheat last Fall; ate and destroyed my timothy twice; sowed the ground again this Spring, but as there are still plenty of hoppers there is not much hope for a stand.—[Letter extract from G. Pauls, Eureka, Mo., Nov. 10, 1874.

> Some of our good friends in Suffolk county, Virginia, were unduly excited this Summer over the idea that the Western destructive grasshopper, *Caloptenus spretus* of Uhler, had found its way to the "sacred soil of Virginia." There was no denying the fact that myriads of grasshoppers were devouring nearly "every green thing," even settling on the trunks and limbs of trees, and gnawing the bark in a most unkind manner; and as it appeared to be something altogether foreign to the locality, of course, it must be the western pest. Specimens were forwarded to us, however, and a glance was sufficient to show us there was no need for alarm, as it was quite a common species in this part of the United States, and though rather too plentiful in this particular locality, would not spread or become the terror that its western distant relative has proved. The insect is known as the *Acridium Americanum*, and is of large size, often measuring over two and a half inches in length.—[C. R. Dodge, in *Rural Carolinian*, November, 1874.

In short, during hot and dry years, which are favorable to the multiplication of crickets and locusts, more or less injury is done, in all parts of the country by species indigenous to the different localities, but which in ordinary seasons do not attract any special attention. In every case, however, except in the mountain regions where the Eastern and the Western long-winged species are at home, or the country to which they migrate; the injury is caused by non-migrating species.

The principal depredator in such cases, in the Mississippi Valley, is the wide-spread Red-legged Locust, already described and illustrated, (p. 125) and so often confounded with the true migrating Rocky Mountain species. The next most injurious is the Differential Locust (*Caloptenus differentialis*, Walk., Fig. 33), a species at once distinguished, in the more typical specimens, from the preceding, not only by its larger size, but by its brighter yellow and green colors. The head and thorax are olive brown, and the front wings very much of the same color, and without other marks have a brownish shade at base, the hind wings being tinged with green; the hind thighs are bright yellow, especially below, with the four black marks as in *spretus*, and the hind shanks are yellow with black spines, and a black ring near the base. Next in injuriousness comes the Two-striped Locust (*Caloptenus bivittatus*, Say, Fig. 34,) also a larger species, of a dull, olive-

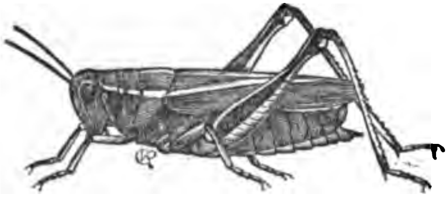
[Fig. 33.]



DIFFERENTIAL LOCUST.

green color, the hind thighs conspicuously yellow beneath, and with two yellow lines extending from above the eyes along each side of the thorax superiorly, and thence, more distinctly on the front wings, narrowing and approaching toward their tips, when closed. All these species belong to the same genus as our Rocky Mountain Locust, and, except in being unable to sustain flight agree with it in habit.

[Fig. 34.]



TWO-STRIPED LOCUST.

There are several locusts belonging to other genera which are common over large areas from the Atlantic to the Mississippi; and some of them, belonging to the genera *Acridium* and *Œdipoda* have relatively longer wings than the common Red-legged Locust, and consequently greater power of flight. Yet they are seldom as injurious as the short-winged Calopteni just enumerated, and the swarming of *Acridium Americanum* (our largest species), as described in the paragraph from the *Rural Carolinian* is quite exceptional.

ENEMIES AND PARASITES.

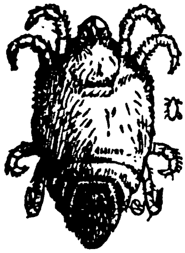
It is fortunate for man that, as in the case of most noxious insects, this locust is not without its numerous enemies. Chickens, turkeys and hogs devour immense quantities, and are happy during years of locust invasion, or whenever these insects abound. Prairie chickens and quails devour them with avidity, and even hunt for their eggs; swallows and blackbirds pursue them unrelentingly; the little snow birds devour great quantities of eggs when these are brought to the surface by the freezing and thawing of the ground; and the same may be said of almost all birds inhabiting the Western country in Winter; for in the crops of warblers, plovers, snipe and other birds killed by the telegraph wires in the vicinity of Lawrence, Kansas, my friend, G. F. Gaumer, found these eggs last Winter. The Shrike, or Butcher-bird, impales them on to thorns and other pointed substances; and a number of other birds, as well as reptiles, e. g. toads, frogs and snakes, feast upon them. But by far the most effective helps in weakening the vast armies of locusts, are the parasitic insects, albeit their work is perhaps less noticeable and less appreciated. Passing over the few, like certain species of Digger Wasps, belonging to the genus *Scolia*, which occasionally bury a few specimens as provision for their young; the ferocious Asilus-flies, which occasionally pounce upon a specimen and suck out its juices, and the omnivorous ant, which is reported as feeding on the eggs and on the weak, sickly and disabled hoppers—it will be well to treat more fully of those parasitic species which render effective service to man in destroying this locust. These consist principally of two mites (class *Arachnida*,) which are external feeders, and two Dipterous flies belonging to the family *Muscidæ*, which are internal feeders.*

The Silky Mite (*Trombidium sericeum* Say, Fig. 35).—Last May, Prof. C. E. Bessey sent me a pale red mite with an account of its attacking the eggs of the Rocky Mountain Locust in northwestern Iowa, and numerous accounts were published of the efficient work of this little animal in destroying said eggs, wherever these had been deposited in Iowa and Minnesota. The following may be quoted as a sample:

> A discovery has been made of great interest. A small red bug, or spider, about the size of a small kernel of wheat, is found in great numbers, creeping into the holes to the grasshopper eggs and eating the contents of the eggs voraciously. Great numbers were found in the act of eating the eggs, with empty egg-shells in the same nest. The extent of the little friends is not limited, but they have been seen in many localities in different directions in this place. Mr. J. D. Johnston, Autrim, proved conclusively that these red bugs are making sure work among the eggs.—[*Madelia* (Minn.) *Times*.

This mite belongs to the genus *Trombidium*, only two N. A. species of which have been described, viz., the *scabrum* Say, and the *sericeum* Say. The descriptions in both instances are very brief, and it is difficult to say whether the species in question, and which is herewith figured (Fig. 35) belongs to either. It answers to *sericeum* however, so far as the description goes, and I prefer to so refer it rather than describe it as new. The specimens which I have examined have not been full grown, and the pale red color which they possessed would doubtless have intensified with age. Every European is familiar with the Scarlet Mite (*T. holosericeum*, *L*), which is common in the soil of gardens in Spring and preys upon young larvæ of various descriptions. In color, silkiness and habit it greatly resembles our species and may indeed be identical. All the species of this genus are highly colored and the *Trombidium tinctorium* found in Guinea and Surinam is employed as a dye.

[Fig. 35.]



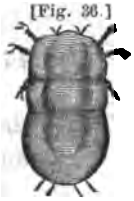
The Silky Mite, natural size shown at side.

---

* The only other internal parasite affecting locusts in this country is a small, undescribed Chalcid-fly which Mr. Scudder refers to as having bred from the eggs of *Œdipoda Carolina* (Proc Bost. Soc. Nat. Hist., XII, p. 99). He has kindly furnished me with female specimens. They are about 0.20 inch long, pitchy black, the head and thorax very deeply pitted and roughened, and the abdomen which is flattened and quite tapering also deeply marked with irregular, longitudinal depressions. The antennae have the scape as long as the flagellum, which is curved and enlarges to tip, which is suddenly docked. The scape, basal joint of flagellum and legs are honey-yellow; the wings hyaline.

The Locust Mite (*Astoma gryllaria* LeBaron, Fig. 36).—This, though a smaller mite, is even a more efficient enemy than the preceding. Almost every one who has paid any attention to the locusts must have noticed that they are often more or less covered, especially around the base of the wings, with small red mites, seldom larger than the head of a pin. These mites have but six legs which, though easily visible when the animal first attaches itself, become more or less obsolete and invisible as it swells and enlarges, though a careful examination will generally reveal them at the anterior end of the body. The mite, therefore, more often presents to the ordinary observer a bright red, swollen, ovoid body, so immovable and firmly attached by its minute jaws, that those who are not aware of its nature might easily be led into believing it a natural growth or excrescence. In fact, it attacks the Locust precisely as the different wood-ticks attack man and the lower mammals.

[Fig. 36.]



The Locust Mite, greatly enlarged.

This mite belongs to the genus *Astoma*, briefly characterized by Latreille for a very similar mite (*Astoma parasiticum*) which affects the common House-fly and several other insects. The specific name *locustarum* was first proposed for it by B. D. Walsh,* but Dr. LeBaron afterwards gave it the name of *Atoma gryllaria*,† in connection with the following more detailed description:

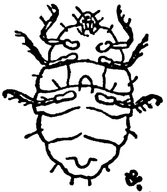
> They are of an oblong, oval form, moderately convex and having an uneven surface, produced by four shallow depressions on the upper side, the two larger near the middle, and the others behind them. The body has also two slight constrictions, giving it the appearance of being divided into three segments; but the impressions are superficial and only visible at the sides. The whole surface is finely striate, under the microscope, the striæ running in a waving transverse direction. The mouth-organs appear to be reduced to their minimum of development. The only part visible, externally, is a minute papilla, on each side of which are two bristles, the inner of which is stouter, tapering to an acute point, and curved inwards, or towards its fellow of the opposite side. They differ from the majority of Acarides in having but six legs, and these, being of but little use in so stationary a creature, are short and slender, projecting but little beyond the outline of the body. They are 6-jointed [in reality they are 5-jointed, the middle joint much the shortest, and the terminal joint longest.—C. V. R.], garnished with short stiff bristles, and terminate in two slender, curved hooks. The anterior and middle legs are closely approximate and situated near the anterior extremity of the body; the posterior are set a little nearer to each other, and a little in advance of the middle of the body, being inserted at the posterior part of the anterior division or lobe. Four hairs project from the posterior extremity of the body.

---

* *Practical Entomologist*, I, p. 126.

† LeBaron's 2nd Ills. Ent. Rep., 1872, p. 156. The author employs the term *Atoma*, which, though first so employed by Latreille, is corrected to *Astoma* in his "Genera Crustaceorum et Insectorum," I, p. 162, (1806).

[Fig. 37.]



Astoma parasite of the House-fly.

The dorsal figure on the opposite page (Fig. 36) exhibits the general appearance of the mite under a high magnifying power, and figure 37 which represents a ventral view of the mite found on our house-flies, and which is doubtless the *A. parasiticum* of Latreille, will better show the structure of the head and legs. During some seasons scarcely a fly can be caught that is not infested with a number of these blood-red mites, clinging tenaceously around the base of the wings.

As remarked in my last Report (p. 56) the genus *Astoma* and probably most other six-legged genera, are only larval or immature forms of some other mites; and this very Locust mite may be the larva of the Silky mite previously described, for ought we know to the contrary—there is so much to learn yet of the transformations of the Mites. Indeed, Hermann, and some other arachnologists have actually referred *Astoma* to *Trombidium.* In speaking of the Irritating Harvest Mite (*Leptus irritans* Riley, 6th Rep. p. 122) the so-called Jigger of the Mississippi Valley, and which is, in all probability, an immature form; I have stated my belief that its normal food must, apparently, consist of the juices of plants and that "the love of blood proves ruinous to those individuals who get a chance to indulge it; for unlike the true chigoe, the female of which deposits eggs in the wound she makes, these harvest mites have no object of the kind, and, when not killed at the hands of those they torment, they soon die—victims to their sanguinary appetite."* The same argument may, I think, be applied to the Locust Mite.

The Rocky Mountain Locust infested with this mite was sent to me in 1868 by Uriah Bruner, of Omaha, Nebr., and in 1869 by Clark Irvine and O. Twine, of Oregon, T. K. Faulkner, of Whitesville, and Jno. D. Dopf, of Rock Port, Mo.,—the latter gentleman stating that it was fast causing a diminution in the number of its victims. I have also received it from Minnesota and Kansas, and found it on several of our native locusts; while the following passage from an editorial account of the ravages of locusts in Kansas in 1869, which appeared in the *Prairie Farmer*, (Aug. 21, 1869,) is a sample of many newspaper accounts, and will show how efficient even a mite may be in killing.

> The course of the locusts was brought to a sudden halt by the operation of some parasite, appearing in the shape of small red mites, which attach themselves to the body, under the wings, where they suck the carcass to a dry shell; the dead bodies of

---

* *Am. Naturalist*, Vol. VII, p. 19.

the grasshoppers almost covering some plants, where they have taken hold of a leaf or stalk, and clasped it, with a dead embrace; many others fall to the ground to die, too weak to rise again. In a half day's examination, where they were very thick, we failed to find more than two grasshoppers not so attacked, and this was not local, for a distance of thirty miles across the country they were found similarly affected.

THE ANONYMOUS TACHINA-FLY.—Our Locust, like so many other insects, is also subject to the attacks of certain two-winged flies much resembling the common House-fly, but larger. One is the very same Tachina-fly (*Tachina anonyma*) which I have bred from a number of other insects.* I first reared this fly from specimens of the Rocky Mountain Locust sent me by Jos. C. Shattuck, Vice Prest. of the Union Colony, Greeley, Col., who wrote, July 14, 1873, as follows of its work:

> * * Also, I will say that the grasshoppers which a month since seriously threatened to devour every green thing, have met with a mortal foe and been slain by millions. (Don't think "millions" too large a word.) Very few have "taken to themselves wings and flown away," as heretofore, but lie dead in the fields they lately ravaged. A small fly pierces them and deposits an egg *while on the wing*, (or on the jump) and like Herod of old "they are eaten of worms and give up the ghost."

The following items undoubtedly refer to the same insect:

> *A Grasshopper-Exterminating Fly.*—It seems that the grasshoppers that are so destructive to vegetation in many places in the central portion of the continent, are likely to find an enemy which threatens their rapid destruction. The Deer Lodge *Independent* says that a fly has made its appearance, closely resembling the common house-fly, but much larger, and of a gray, mottled color, which deposits its eggs under the wings of the Grasshopper. The egg is enclosed in a glutinous substance, which secures it in its position until the worm is matured [embryon developed.] It then penetrates the body of the Grasshopper, which speedily dies. The worm then burrows in the ground, and at the end of seventeen days comes forth a fly, ready to again commence the work of destruction. Mr. Wm. Walker, of Dempsey Creek, informs the *Independent* that twice during the past Summer the grasshoppers threatened to destroy his crops, but the flies killed them so rapidly that they did him but little damage. As the grasshoppers were killed before depositing their eggs, it is generally believed that this plague is ended in the Deer Lodge Valley.—[Published in several Montana papers in Summer of 1874.

> A great many of the locusts seemed to be punctured on the back, and on pulling their heads off after death (many were found dead) from 1 to 8 ordinary looking maggots would be found. Many farmers fear it might be an introduction of a new plague. May not this gentleman with his little gimlet in time prove the destroyer of the hateful Locust?—[R. P. C. Wilson, Platte City, Mo., in private letter.

> I saw a hopper kicking about as if he could hardly move; I pulled him to pieces and found that he contained a footless grub, half an inch in length. In a short time more were procured, placed in a covered tumbler, where, in a little more than two weeks, the grubs changed to Tachina flies, very much resembling the common house-flies. * * When we remember what an enormous number of eggs (fly-blows) a fly will lay and that each, in about a month, will be a perfect fly, it is seen that it would take but a few generations to clean out an army of grasshoppers—[Oscar J. Strong, Rolfe, Pocahontas county, Iowa, in *Western Farmer*, Feb., 1869.

Mr. Byers, in speaking of the locusts hatching in Colorado in 1865, (*loc. cit.*) says: "That upon attaining about half their full size, they were attacked by a fly, which, stinging them in the back between the root of the wings, deposited one or more eggs, which produced a large white maggot. The worm subsisted upon the grasshopper, finally causing its death, when it cut its way out and entered the earth. In this way probably half were destroyed, often covering the ground, and filling the furrows in plowed fields with their carcasses. The remainder took to flight, moving southeast, when their wings were sufficiently developed, and we lost trace of them on the great Plains."

---

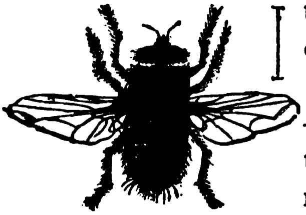
* See Repts. 4, p. 129 and 5, p. 133.

Mr. J. W. Crow, of Bigelow, Mo., in his correspondence with me, describes these maggots as infesting the "hoppers" in Holt county last Fall; and in 1869 I received the parasite from John P. Dopf, of Rock Port, Atchison county, and have bred it from the Differential Locust, figured further on, and from the Carolina Locust (*Œdipoda carolina*, L.) in St. Louis county.

Finally, Mr. S. E. Wilber, of Greely, Col., has published an account of what is evidently the same fly.* In this account, after showing how persistently the fly pursues the Locust—leaving it no rest, and so effectually weakening whole swarms as to render them harmless—he expresses the opinion that the constant importunities and annoyances of this fly are the cause of locust migrations. While, however, they may constitute a factor in the result, such a conclusion is too sweeping.

The Red-tailed Tachina-fly (Fig. 38) which is so useful in destroying the Army-worm, will serve to illustrate the species, and, indeed, differs scarcely at all except in having the tip of the abdomen red.

[Fig. 38.]



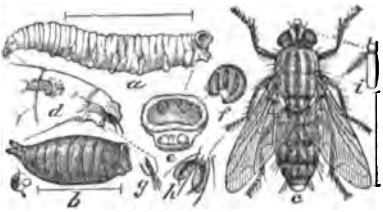
Red-tailed Tachina-fly.

These Tachina-flies firmly fasten their eggs—which are oval, white and opaque and quite tough—to those parts of the body not easily reached by the jaws and legs of their victim, and thus prevent the egg from being detached. The slow-flying locusts are attacked while flying, and it is quite amusing to watch the frantic efforts which one of them, haunted by a Tachina-fly, will make to evade its enemy. The fly buzzes around, waiting her opportunity, and when the locust jumps or flies, darts at it and attempts to attach her egg under the wing or on the neck. The attempt frequently fails, but she perseveres until she usually accomplishes her object. With those locusts which fly readily, she has even greater difficulty; but though the locust tacks suddenly in all directions in its efforts to avoid her, she circles close around it and generally succeeds in accomplishing her purpose, either while the locust is yet on the wing, or, more often, just as it alights from a flight or a hop. The young maggots hatching from these eggs eat into the body of the locust, and after rioting on the fatty parts of the body—leaving the more vital parts untouched—they issue and burrow in the ground, where they contract to brown egg-like pupæ, from which the fly issues either in the same season or not till the following Spring. A locust infested with this parasite is more languid than it otherwise would be; yet it seldom dies till the maggots have left. Often in pulling off the wings of such as were hopping about, the bodies have presented the appearance of a mere shell, filled with maggots; and so efficient is this parasite that the ground in parts of the western States is often covered with the Rocky Mountain Locust dead and dying from this cause.

---

* Popular Science Monthly, IV, p. 745.

[Fig. 39.]



Sarcophaga sarraceniæ.—*a*, larva, *b*, pupa, *c*, fly, the hair lines showing average natural lengths; *d*, enlarged head and first joint of larva, showing curved hooks, lower lip (*g*), and prothoracic spiracles; *e*, end of body of same, showing stigmata (*f*) and pro-legs and vent; *h*, tarsal claws of fly with protecting pads; *i*, antenna of same—enlarged.

THE COMMON FLESH-FLY (*Sarcophaga carnaria*, Linn.)—This fly, which is at once distinguished from the Tachina-fly by the style of the antenna being hairy (Fig. 39, *i*,) instead of smooth, is also a great enemy of the Rocky Mountain Locust, though I think it must be looked upon more as a scavenger than an active parasite, and that it is attracted more especially to those specimens which are feeble or already dead. I have received it among the Tachina parasites sent by Mr. Shattuck from Colorado, and from Professor C. E. Bessey, of Ames, Iowa, who bred it from the Differential Locust, and published the following description of its work:

> A COMMENDABLE FLY.—During the Summer I noticed that many of the large yellow grasshoppers (*Caloptenus differentialis*) were infested by the maggot of a species of fly very nearly resembling, if not identical with the common Flesh-fly (*Sarcophaga carinaria*). Many of the grasshoppers were almost completely eaten out when found, retaining just sufficient strength to hop feebly over the ground. I estimate that this particular species of grasshopper was diminished in numbers at least one-tenth, possibly one-eight, by these new friends. It is to be hoped that these new parasites will increase rapidly. Professor C. V. Riley informs me that the Migratory Locust (*Caloptenus spretus*) is also infested by a similar one; thus far, however, I have failed to detect any in the specimens collected in this vicinity.

I have also bred it from a number of our native Locusts whose carcasses—forsaken by the sarcophagous larvæ—may quite frequently be seen fastened to the upright stems of different plants, in the Fall of the year. I have also bred it from the common Carolina Mantis*, which it attacked while living; and have known it to infest the common Walking-stick (*Spectrum femoratum*). Indeed, the species is a most widely-spread and general scavenger, occurring in most civilized countries, and feeding as a rule on dead and decaying animal matter, and only exceptionally on living insects. By way of illustrating its transformations, I introduce a figure of the Sarracenia Flesh-fly (*Sarcophaga sarraceniæ* Riley) which feeds on the dead insects caught in those curious traps, the trumpet-leaves (*Sarracenia*), and which so closely resembles the common Flesh-fly in question, that it is probably only a variety.* These flies deposit living larvæ, which are distinguished from those of the Tachina-flies by being more concave and truncated at the posterior end. (See Fig. 39, *a.*) The Tachina larva is rounded posteriorly, with a small spiracular cavity, easily closed, and having a smooth rim: it contracts to a pupa which is quite uniformly rounded at each end. The Sarcophaga larva is more truncate behind, with fleshy warts on the rim of the spiracular cavity, and with a more tapering head: it contracts to a pupa, which is also truncate behind, and more tapering in front, where the prothoracic spiracles show as they never do in Tachina.

---

* On the 18th of October, 1868, at South Pass, Ills., I found fastened to a tree, a large female Mantis, still alive, but with the abdomen hanging down, partially decomposed, and filled with Sarcophaga larvæ. These remained in the larva state in the ground till the next July, but gave forth the flies at the end of that month. The flies marked in my cabinet *Sarcophaga carnaria*, var. *mantivora*, differ in no respect from the common *carnaria*, except in size, seven not averaging more than 0.20 inch in length.

REMEDIES: HOW BEST TO PREVENT LOCUST INJURIES.

In considering this subject, it will be advisable to classify the agencies to be employed by the husbandman in protecting himself from Locust injuries. We shall then find that they may be classed under four heads: 1st, natural agencies; 2d, artificial means of destroying the eggs; 3d, such means of destroying the unfledged young; 4th, remedies against the mature and winged insects.

1st—The natural agencies, which I have just enumerated, should be encouraged as far as it is possible to encourage them; and it is very gratifying to know that the last Kansas Legislature had a sufficient appreciation of this matter to pass a law prohibiting the destruction of prairie chickens and quails.

2d—In the destruction of the eggs, man can accomplish most in his warfare with the insect. This fact has long been recognized in all European and Asiatic countries that suffer from locust depredations; and in France, Italy and several other countries, a reward of so much per kilogram, or other measure,,is always offered by the government whenever agriculturists suffer from invasions. When we consider the number of persons rendered destitute in Kansas, Minnesota and Nebraska, by the invasions of 1874, and the danger of immense damage in 1875, from the issue from the eggs which in many places fill the ground, it is surprising that the Legislatures of those States did not give the inhabitants of the ravaged counties at once the means of warding off misery and suffering, and guarding against future destruction, by offering a liberal price per bushel for locust eggs. Let us hope that, whenever such a calamity befalls those States again, something of this kind will be done.

---

* The flies bred from *Caloptenus* have the tip of the abdomen reddish, as in *Sarcophaga sarraceniæ*, and indeed are undistinguishable from the smaller specimens of this last. The larva differs, however, in having the surface more coarsely granulated, it being regularly and uniformly covered with minute papillæ; in the less conspicuous prothoracic spiracle; in the smaller but deeper anal cavity; and in the rim of this cavity having the twelve tubercles more conspicuous. The pupa also has the anal cavity smaller, more closed, but deeper; and the prothoracic spiracles less prominent. In these respects it agrees more closely with the typical *carnaria*, as described by Packard, and I have little doubt but all these differences are simply varietal.

Wherever the eggs were laid last Fall, I advised our farmers, where it was practicable, to plow deeply, so as to turn them under and bury them as far as possible. This destroys them either entirely or in great part, and if a few survive, the young hatch so late the next season, that their power for harm is much lessened; and the horses, also, in the ravaged districts, are in much better condition to plow in the Fall than they are likely to be in the following Spring. Care should be had not to bring the eggs turned under in Autum, to the surface again, by plowing the same land the following Spring; for, thus brought to the surface, the eggs would undoubtedly hatch.

When irrigation is practicable, as it is in some of the ravaged parts of Colorado, let the ground be thoroughly inundated for a few days, and the eggs will all lose vitality and rot. I have already shown that the eggs are laid, by preference, on the high and dry knolls and ridges, and never in low, moist ground; and experiments prove how soon they succumb to excess of moisture.

Just as excessive moisture is fatal to the eggs, so is excessive dryness, or direct exposure to the atmosphere, so that they receive alternately the direct rays of the sun and the rains and dews. Consequently, harrowing the ground where these eggs are laid, so as to break up the glutinous masses and expose the eggs to the influences mentioned, and to the more easy detection of birds, is to be recommended. Of course none of these measures, except the first, or collecting the eggs, are applicable on a large scale, except where the country is thickly settled and cultivated fields are abundant. Wherever hogs and cattle can be turned into fields where the eggs abound, most of these will be destroyed by the rooting and tramping.

3d—Next to the destruction of the eggs, the destruction of the young, wingless locusts, is most within man's power. Thus, much good can be accomplished by the use of a heavy roller, when the young hoppers first hatch in Spring, or late in the Fall, as they exceptionally do when that season is prolonged and warm. In meadows and prairies they may be destroyed by fire started in a circle around them; or they may be driven into windrows of straw or hay, and then destroyed by fire; for when these young are traveling they can be driven almost as easily as a herd of sheep. Mr. N. C. Meeker, of Greeley, Col., states that in this way the farmers there manage to save 50 acres of grain at a cost not exceeding $20. Their course can also be governed by beating with brush until the advance guard is turned, when the balance follow the leaders. Wherever there are running ditches on a farm, the young can be driven into these and then caught and killed in sieves or coarse sacks. This method is quite commonly employed in those parts of the West where irrigating ditches and canals abound. In locust countries it is also a quite common practice to drive the young into a heap against any converging barrier, and then to destroy them by bagging or crushing.

The attempts to protect the plants by sundry applications, such as strong salt water, air-slacked lime, carbolic acid, etc., have proved unsatisfactory; and from the collective experience of a number of intelligent farmers in Colorado, which I made it a point of obtaining in 1873, I feel that nothing is to be hoped for from such substances. In 1868 and 1869, I sent two large cans of cresylic acid soap to Mr. Stephen Blanchard, of Oregon, Holt county, to be tested as a means of protecting his vegetables; but he in the end concluded that nothing would avail. Paris Green, as used for the Doryphora, will doubtless kill such locusts as partake of it; but its general use on all the plants which these omnivorous creatures relish, is out of the question. However, there is yet room here for experiment, though, considering that in all historical times, the resources of many nations have been employed against Locusts without furnishing anything that will protect plants on a large scale—little hope can be entertained of discovering such a substance. Turnips of which they are especially fond, kohlrabi, carrots, and the like, may be saved when the insects come late; by cutting off the tops and covering the roots with earth—the tops making excellent food for milch cows. The earth should be removed again as soon as possible to prevent the rotting of the roots.

Where the means already suggested cannot be employed, there are yet two methods of destroying these young, namely: by catching them in hand-nets, such as entomologists use, and as were described in my 5th Report; and crushing them with broad wooden shovels attached at an oblique angle to some kind of handle.

Finally, as Mr. Snyder well shows, in his letter which I publish in the Appendix, most cultivated plants may be protected from the ravages of these young by good cultivation and a constant stirring of the soil. The young have an antipathy to a lose and friable surface, which incommodes them and hinders their progress; and they will always leave such a surface for one more hard and firm. I say, therefore, to those in the districts where the locusts hatch out: get your crops in early; employ some one or all of the means here indicated; get your neighbors to do the same; but by all means cultivate thoroughly. Let the local granges take the matter in hand, and by resolution oblige united action among themselves, at least, by establishing a fine or some other penalty, to be paid by any recusant and neglectful members. If the means here enumerated are adopted in concert over the more thickly settled portions of the threatened country, as in our own western counties, prospective injury may be averted, and the enemy be rendered comparatively harmless until the danger is passed. Two or three month's energetic work will suffice. Determination perseverence and united action must be the watch-words. With these, the people in the stricken counties will accomplish more good than would have been accomplished by the $50,000 which the Legislature refused them last winter. In the less thickly settled parts no human agency is likely to affect the pest, and we can only hope that Providence, by the different natural agencies known to be fatal to it, may act where man is impotent.

4th—The destruction of the winged insects when they swoop down upon a country in prodigious swarms, is impossible. Man is powerless before the mighty host. Special plants, or small tracts of vegetation may be saved by perseveringly driving the insects off, or keeping them off by means of smudges, as the locusts avoid smoke. Great numbers may be caught and destroyed by bagging and crushing as recommended for the new-fledged; but as a rule the vast swarms from the west will have everything their own way. Mr. Kelsey succeeded in saving many of his young forest trees in Kansas by perseveringly smudging and smoking them.

He gives his experience in the following words in the *Kansas Farmer*, Aug. 26, 1874:

> At first we tried building fires on the ground, but it was not successful. The smoke would not go where we wanted it to. We then tried taking a bunch of hay and holding it between sticks, would fire it, and then, passing through the field on the windward side, would hold it so that the smoke would strike the grasshoppers. We would soon have a cloud of hoppers on the wing, and by following it up would, in a short time, clear the field. We have thus far saved everything that was not destroyed when we commenced fighting them, and while I do not give this as an infallible remedy, not having tried it sufficiently, yet it does seem to me, from what I have seen of it, that one good active man who would attend right to it could protect a twenty acre field or a large orchard. But to be successful one must attend right to the business.

Smoke and scare, and keep it up until the hoppers leave, and if they attempt to come again, be after them with your smoke. Give them no peace from morning till night.

Sweetened water will measurably protect plants when the insects are not too ravenous. The same is true of old hay which was extensively used to cover and protect favorite garden plants. One of the few effectual means employed against the winged insects last year in grain fields was to "rope" the fields. This was done by hitching each end of a long rope to a horse and then causing it to be dragged over the grain, thus disturbing the insects and causing them either to fall to the ground or fly off. If continued the locusts get disgusted and leave. While this, and all other methods, are futile as against the vast swarms which continue to drop down upon a country for days, it will prove useful against local swarms when they become fledged, or small swarms which may suddenly alight in restricted localities. They should be driven off as much as possible towards evening, because they then use their wings reluctantly, and they do great injury during the night.

SUGGESTIONS THAT MAY BE OF SERVICE.

In addition to the foregoing remedial and preventive measures to be taken in dealing with locusts, a few other suggestions occur which may be of advantage. The plants that can be grown which are unmolested by the pests and which will not, in all likelihood, suffer, have already been enumerated: those which are cultivated are principally peas and other leguminous species, castor beans, sorghum, broom-corn, tomatoes, sweet potatoes, etc. The locusts, are, as already stated, particularly fond of tansy, cocklebur, and Amaranthus, and especially of turnips: why, therefore, should these not be sown around a grain-field, and periodically sprinkled with Paris Green water, so as to kill large numbers of the young insects? These last will also congregate on timothy in preference to other grasses or grain, and a strip of timothy around a corn or wheat-field, to be poisoned in the same way, might save the latter. It is also currently supposed that the common larkspur (*Delphinium*) is poisonous to these insects, but how much truth there is in the statement I am unable to tell. In going through an oats-field the winged insects drop a great deal of the grain, which, when ripe enough, might at once be harrowed in so as to furnish a good growth of fodder that can be cut and cured for Winter use. The lesson of 1873 and 1874 should also not go unheeded. The former year was one of plenty, and corn was so cheap and abundant that it was burned for fuel in many sections where in 1874 there were empty cribs and the farmers wished they had been more provident.

Nothing, however, will so surely insure those States subject to them, against the ravages of this insect, as irrigation. With water at command, the farmer in all this locust area is measurably master of his two greatest insect plagues, and full master of the young locusts; and if there were no other reasons to be urged in its favor, these are sufficient to warrant those States included in said area, in using all means in their power in having schemes for irrigation perfected and carried out as far as the topography, soil, and other peculiarities of the country will admit.

Finally, in cases where, as in some parts of Kansas and Nebraska last Autumn, famine stares the people in the face, why should not these insects be made use of as food? Though the question will very generally cause the reader to smile, and the idea will seem repugnant enough to the tastes of most, I ask it in all seriousness. It is to be hoped that none of the people of this grand and productive country will ever be reduced to the diet of John the Baptist; but it should not be forgotten that the locusts may be made use of as food; that they are quite nutritious, and are, indeed, highly esteemed by many peoples. I do not intend in this connection to write an essay on edible insects, though a very curious and startling one might be written on the subject; but I wish to insist on the fact that in many parts of Asia and Africa subject to locust plagues, these insects form one of the most common articles of food. Our own Snake and Digger Indians industriously collect them and store them for future use. Deprived of wings and legs, they are esteemed a great delicacy fried in oil, or they are formed into cakes and dried in the sun—sometimes pounded into flour, with which a kind of bread is made.

Love or dislike of certain animals for food are very much matters of habit, or fashion; for we esteem many things to-day which our forefathers either considered poisonous or repulsive. There is nothing very attractive about such cold-blooded animals as turtles, frogs, oysters, clams, crabs, lobsters, prawns, periwinkles, snails, shrimps, mussels, quahaughs or scallops, until we have become accustomed to them; and what is there about a dish of locusts, well served up, more repulsive than a lot of shrimps; they feed on green vegetation and are more cleanly than pigs or chickens. Who can doubt but that the French during the late investment of Paris would have looked upon a swarm of these locusts as a manna-like blessing from heaven, and would have much preferred them to stewed rat? And why should the people of the West, when rendered destitute and foodless by these insects, not make the best of the circumstances, and guard against famine, by collecting, roasting and grinding them to flour? Surely, with modern cookery they can improve on the Digger Indians in making a locust dish that shall be attractive and palatable even to those not predisposed from sharpened appetites, to judge favorably; and in any event it would pay under such circumstances to roast and preserve them as food for poultry and hogs.

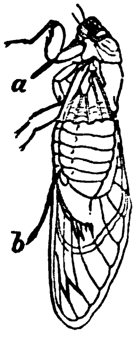
NOMENCLATURE.

Regarding the popular name of our insect there is great lack of uniformity in the terms by which it is designated, and many of the readers of this Report who have been accustomed to hearing these insects very generally called "grasshoppers," will doubtless wonder why I have not followed common usage. The term "Grasshopper" is very generally employed for these insects in America, but should be abandoned for that of "Locust," which is applied to similar species in all other parts of the world, the "locusts" of Scripture being very closely allied species. As I have already said, (6th Rep. p. 153, note):

> It is to be regretted that American entomolgical writers do not more strictly follow Harris in conforming to the English custom of calling these insects—with short antennæ and stridulating by means of the stout hind legs—by the popular term of "locusts," which is in the keeping with ancient usage. The term "grasshopper" would then be confined to the long-horned and long-legged, green group, stridulating solely with the wings, in which the species are more solitary and never congregate in swarms, and in which the female is invariably provided with a sword or cimiter-shaped ovipositor; while the term Katydid could be used to designate the few larger, tree-inhabiting species of the group, so designated by Harris. Where the habit of calling the Cicada "Locust," and the "Locust" of ancient usage "Grasshopper," is as inveterate as in this country, it is not easy to change it; but it seems to me that the change is desirable, and if popular authors would only continue the example of Harris, the change would come about with the greater dissemination of entomological information.

Almost every entomological author has been under the necessity, at one time or another, of insisting that the "Grasshopper" of this country is the "Locust" of Europe and of antiquity; or of endeavoring to clear up the confusion which results from the popular application of this last term to the Periodical Cicada or Harvest-fly—an insect (Fig. 40) which dwells, in its early life, under ground, and feeds by sucking the sap of trees, and which is no more capable, like the true locust, of devastating our grain-fields than a calf is of killing and devouring our sheep. Yet the ceaseless preaching about the popular misapplication of these terms in America will avail nothing so long as the popular error is encouraged by the preachers themselves adopting the misapplication. The popular names of a country should be respected as much as possible, especially for objects peculiar to the country, and I would be the last to try and change them

[Fig. 40.]



CICADA, or miscalled locust: with one wing removed, so as to show the beak and vipositor.

for trivial reasons; but when, as in this instance, the name used for centuries in the older countries, and become familiar as household words through the widely disseminated Scriptures, is substituted by a new one, and transferred to an entirely different insect, there is no excuse for perpetuating the popular error.

We may talk of *shipping* a car-load, and of the *sun's rising*, from now till doomsday; and, though, to the intelligent and hypercritical mind the expressions will ever savor of incorrectness; no one is foolish enough to try and reform them, because they are universal, wherever the English language is spoken. Change in universal and long established customs is neither possible, as a rule, nor advisable; and it is doubtful if any reform could be brought about in our present Gregorian calendar, for instance, even if the advantage of regulating the divisions of the year by the astronomical conditions of the earth's orbit could be fully established. But in a case like that between the use of the terms LOCUST and GRASSHOPPER, the former, as applied to our Rocky Mountain plague and its allies, has every claim to favor, not only because of having been longer used, and of its now being more universally used than the latter; but because it has a definite meaning and agrees with the old systematic name of the family to which the species belongs; while the term "grasshopper" is most loosely applied to almost every field insect that hops. The term locust is, in fact, supposed to be derived from the Latin words *locus ustus*, which mean a burnt place, and have reference to the desolation, as if by fire, which these insects cause.

The trivial terms "Colorado," "Red-legged," and "Hateful" have been applied to the species by various writers; but the name "Rocky Mountain Locust," which I have employed, is expressive of the insect's habitat and least open to objection.

Regarding the scientific name of our insect, it is only necessary to add in addition to what has already been said, that it belongs to the modern genus *Melanoplus* of Stäl; but just as this author's subdivisions of certain genera in Coleoptera are not accepted or recognized by many of our best coleopterists, so *Melanoplus* is not considered as of generic value by some of our best orthopterists; for which reason I have used the better known and well established genus *Caloptenus*. The specific name *spretus* (meaning despised) indicates that, as a species, it was so long overlooked by entomologists, and confounded with *femur-rubrum*.

PRAIRIE FIRES vs. THE ROCKY MOUNTAIN LOCUST.

The notion has got into the heads of a good many people, that there is some connection between prairie fires and the Locust visitations. Having already discussed the subject in the columns of the New York *Tribune*, I will here repeat what I there said:

The *Kansas Farmer* for September 23d last, contained a lengthy and hortatory article on the effects of prairie fires. The burden of the article was to prove that all misfortune that had befallen the fair State of Kansas was in one way or another attributable to the custom of burning over the prairies. In the words of the writer: "The unbroken succession of curses that have afflicted this and neighboring counties * * all spring from the one first grand cause, the burning of the prairie grasses," and he then goes on to demonstrate, as he believes, that burning the grasses from the face of the earth had been the one great cause of drouth, hot winds, locusts and short crops. The drouth, hot winds, and grasshopper raids of 1860 are attributed to the universal burning of grass in 1859. The short crops of 1864, the locust invasion of 1866, and the bad years of '68 and '70 similarly find their explanation in said article, in the burning of the grass, now attributed to Indians desirous of driving their buffalo herds westward, and of putting between them and the troublesome frontier hunters a "wide, black and impassable waste"—now to the Texan cattle traders who, on their way home from Abeline, fired the prairies on all sides, so that it was burned off "from the North pole to the Gulf of Mexico." The disasters of 1874 were confessedly not preceded by such general conflagrations, but the reduced snow-fall in the mountains is made responsible for that portion of the 1874 disaster which prairie fires did not produce.

The writer then goes on to state some well-known principles of radiation and to explain that all simoons or hot scorching winds have their origin in desert countries, and that "it matters not whether the country is an original desert or whether it is made so by the action of our Western prairie fires. For all present purposes the two are reduced to a common level, and produce a common result—drouth, hot winds, and locusts." Having thus traced the cause of drouth to prairie fires, the article goes on to show how the locusts are a consequence of drouth. The author first asserts that the State has never been "visited by these destructive locusts except during seasons of drouth and hot winds," basing his assertion partly on the fact that Kansas never suffered from these insects during fruitful years. I cannot say how well founded is the assertion, but the latter statement is a simple truism not necessarily proving the assertion. When we remember also the number of drouthy years that have not been succeeded by locust invasions the assertion loses much of its force. As a single instance, let us recall the unprecedented drouth of 1871. This was not preceded, that I am aware of, by any unusual number of prairie fires; but it *was* the indirect cause of most remarkable and destructive conflagrations all over the Western country during the Fall of the same year. Nor was it succeeded by locust invasions, as it should have been were the position of the writer in the *Kansas Farmer* well taken.

The reason given why the locusts can only come in drouthy seasons, is, that they cannot fly in a moist atmosphere, and the facts that they do not readily fly early in the morning, and that the farther east you go, or, in other words, the more moist the atmosphere becomes, the insects diminish in number and consequent power for harm. In further support of this view, it is asserted that at Kansas City, "where two rivers connect with their wide belts of timber shade, with an old settled country surrounding them, so that prairie fires cannot exist, we find no locusts." The author having proved, in this manner, and to his own satisfaction, the connection between burning grass and locusts, closes with a graphic picture of what might have been had misfortune not frowned upon the people, and an earnest appeal to the former—not in one township or section, but over the whole State—to cease burning the prairie, as the only radical cure for all these evils. Now, if he has reasoned well, it is of the utmost importance for the people of Kansas to follow his advice, and the subject is, consequently, well worth a little attention. I will, therefore, give my reasons for believing that while some partial truths have been stated in his thesis, the general conclusions are false and misleading:

1.—It is by no means proved that the simoons which occasionally sweep over our Western States and Territories have their origin in any part of that vast prairie country. Some of the more local of these hot, dry winds may originate or acquire their peculiarly high temperature on the mauvaises terres of Wyoming or the table lands of Arizona and Mexico; but the more general simoons most probably have their origin at a far greater distance from us, viz., in the tropics. These simoons in Missouri always blow from the southwest, in Kansas from south, southwest, and in Eastern Colorado south, or a few points east of south; and their injurious and scorching effects are not unfrequently felt before the frost in Kansas and the country to the west is fairly out of the ground. 2.—It is well known that the buffalo grass ranges over a vast extent of our Western plains, and that it does not furnish a very dense or thorough covering, even when unburned. 3.—My own observations for the past fourteen years in this Western prairie country lead me to the conclusion that fires more often succeed than precede drouth, and that they may more justly be looked upon as a result than as a cause of excessive dry weather; and the prevailing belief that large conflagrations or extensive fires are conducive to rain, bears on this point. 4.—Whenever grass is burned during the growing season, the old and drier blade is soon succeeded by a green and succulent one, which has far greater power to attract and retain moisture; while if burned in Winter time the evaporation from the soil can be thereby but slightly affected, because of the weakened power of the sun, and the snows which usually cover and protect. 5.—Drouths are by no means confined to that portion of the country subject to the locust invasions. 6.—The reason why locusts are more sluggish and less inclined to fly at morn than at noon is not so much a question of the comparative density of the atmosphere as of the difference in temperature. All diurnal insects are sluggish in the cool of the morning, and their activity increases with the rising of the thermometer; and flight, whether of bird or insect, is, I conceive, easier, *cœteris paribus*, in a dense than in an attenuated atmosphere. 7.—The reason why the Rocky Mountain Locust does no damage in the Eastern States, and never reaches beyond a line drawn at a rough estimate along longitude 17° west from Washington, is, I take it, rather because, first, there is a definite limit to its power of migration from its native home in a single season; second, because the new conditions which it meets with in the lower country forming the eastern limit, injuriously affect it and kill it off in the course of one or two years. 8.—The statement about the Kansas City region is simply incorrect, as the locusts were thick around that city the present year. 9.—As the Rocky Mountain Locust multiplies only in the Rocky Mountain region, its descent into the plains to the East where it cannot thrive, cannot well be affected by the burning of the grass on those plains.

Having thus given some facts which militate against the conclusions arrived at in the *Kansas Farmer* article, let us now consider, as a still farther offset against those conclusions, the benefit resulting from the burning of prairies. Fearful as are the ravages of locusts, they are only periodically as general and widespread as they were the present year, and if we consider the annual damage done to the crops of Kansas by any one insect, the Chinch Bug must, I think, be set down as a greater enemy to the Kansas farmer than the Hateful Locust. Even this year, in the eastern portion of that State, the chinch bugs, aided by the excessive dry weather, had so depleted, by their myriad pumping beaks, the later ripening cereals, that these would have made but a very poor return for the labor spent upon them, even had the locusts not made their advent. Now there are no better preventive measures against the injuries of the Chinch Bug than the burning of the grass on our prairies and around our cultivated fields, and the destruction, by the same means, of weeds, leaves, corn-stalks and all other litter and rubbish around such fields, and as far as possible within the woods. For the Chinch Bug hibernates under just such shelter as this litter affords, and the proper season to attack it is in the Winter time, and not at or just before harvest, when it, in great measure, baffles human control.

This statement might be substantiated by a long list of facts in the insect's economy, which it is unnecessary to mention here, and I will simply add in testimony that in Illinois, before the country was as thickly settled as now, and when immense fires annually swept over her prairies, the ravages of the Chinch Bug were scarcely known. It is therefore very patent that the judicious burning of the dead grasses, especially in the vicinity of cultivated fields, will reduce the ravages of this worst of the farmer's pests, and the same will hold true of the False Chich Bug (*Nysius destructor*), which affects our garden vegetables and other tender-leaved plants in the same way as the genuine Chinch Bug affects our cereals. It is also true of many other destructive insects which shelter under dead grass and herbage during the Winter. But, most important of all, it is also true of the young locusts and of locust eggs, immense numbers of which undoubtedly get destroyed by such fires. A strong impression also prevails among farmers, and it is not without foundation, that the burning of our prairies is beneficial in that it returns at once the potash of the plant to the soil, instead of through the slower process of decomposition. From these premises I think we may safely draw the following conclusions:

1.—That the non-burning of the prairies will not prove a cure for all the ills that Kansas is subject to. 2.—That, on the contrary, the judicious burning of such prairies will prove a measurable cure for some of her most serious ills. Indeed, there is only one way in which there can be any real connection between the burning of prairies and the ravages of the Rocky Mountain Locust, and that connection is through the remote past, and altogether beyond our present control. In the report of the Chief Signal

Officer to the War Department for 1872, will be found an interesting account of the great fires of 1871 in the Northwest, by Prof. J. A. Lapham, of Milwaukee, Wis., in which my learned friend maintains that our extensive Western prairies and plains owe their existence and origin to the agency of fire. These fires, encouraged by drouth, and either kindled by accident or intention, have swept over the country for ages, and while they leave the roots of the grass uninjured, they destroy the germs of most other plants, including forest trees; and Mr. Lapham pictures to himself a long-past struggle between forest and prairie, in which the latter, by the assistance of the Fire King, has gained and held the vantage ground.

While I do not agree with Prof. Lapham that the remote cause of our prairies can be attributed to fire, yet no one can doubt its agency at the present time in maintaining these prairies and preventing timber growth in the more humid portions of the great prairie region. But on this hypothesis there would naturally be a connection in the past between fires and locusts; for if without fires this whole prairie region had been timbered, the locusts, which are essentially insects of the plains and prairies, could never have become so prodigiously abundant and injurious. On such a hypothesis alone can I see any possible connection between prairie fires and locust invasions, and, however much truth there may be in the hypothesis, the fact remains that there is no present connection between the two phenomena.

APPENDIX

TO THE

ARTICLE ON THE ROCKY MOUNTAIN LOCUST.

The length which this Report has already attained precludes the publishing of any of the many answers to my circular from the different counties of Missouri. There is so much valuable experience, however, in the following letters, by three valued and intelligent correspondents, from Texas and Kansas, that I feel constrained to publish them entire, as a fitting sequel to what I have said on the Rocky Mountain Locust:

Letter from the late Thos. Affleck, of Brenham, Texas, written in 1868.

About the first week of November, 1867, locusts appeared here, but were announced towards the northwest of us as being on the way some weeks before. They came down from a considerable height in showers about like a fall of snow—their silvery wings contributing to the resemblance. On looking toward the sun, they could be perceived in vast clouds, at a great height, and all steering to the southeast.

They were busily engaged devastating the crops about Union Hill, five miles to the west, for a week before they made their appearance here, and were nearly two weeks longer in reaching Brenham, seven and a half miles to the south-by-east. They were very few in number to the south and east of that town.

Immediately on alighting, they began to devour every green thing, possessing ravenous appetites; and also copulated in great numbers, after which the males gradually disappeared. As food failed them, they would occasionally take to wing in small bodies and go off; but generally "took it afoot" in search of fresh pastures. Everything green in the gardens, turnip patches, wheat-fields, etc., was devoured; and much of the Winter or Prickly Mesquit Grass (*Stipa setigera*) so as greatly to lessen the weight of pasturage, and stint the stock.

When I reached home, about the first of December, they were busy depositing their eggs, and had been so for some two or more weeks before. The female selected high and dry spots, and especially little ridges of hard ground on paths, roads and beaten yards, formed by the washing of water.

They were preyed upon by birds, animals, and other insects. What few hogs were hereabouts, devoured them greedily, as did poultry; they gradually disappeared without being able to say how.

We had some very bad freezes for this latitude, the ground being frozen to a depth considerably below the nests of eggs; and this more than once freezing and thawing during the Winter. We were in hopes that this would have destroyed them, and in rich, black, prairie soil, many thus perished. But enough were left to produce untold myriads of the pests. They began to hatch early in February; when first seen, they were about the size of a big flea; but a few continued to appear for six weeks or more. I perceive, from my "Jottings on the Farm," in the *Houston Telegraph*, that on the 28th of March they began to move—having hitherto fed about close by where they were hatched—though only about five-eighths of an inch in length, and without wings.

I quote from these jottings: "My garden is located on rich, stiffish valley land, and, by the way, is in a very promising condition. Until yesterday there was not a Locust within the twenty acre lot, of which my garden now forms a small part. But two days ago, the *varmints* began to move, on their 'nor'-west coorse,' and accumulated in fearful numbers along the east and south lines of the fence. Strange enough, however, they did not seem inclined to cross over, which they could easily have done by hopping through between the rails. After a day or two of hesitation, they made a fresh start yesterday morning, and poured in on me in myriads. By night, I should say, at a rough guess, that about one hundred bushels, more or less, if carefully measured up, were within the limits of these twenty acres! They took a line diagonally across, hopping along at a rate that would take them over the ground about a mile per day. They present a very singular appearance indeed; not one diverging from 'the way they should go,' or are impelled by their instinct to go. The advance soon struck the north line of the fence; vast numbers, still behind, made no movement beyond a certain strip of prairie sod, left as an intended carriage drive. But, instead of crossing it, they followed it down; clipping the leaves partially from a nice young hedge of Marietta rose, and threatening the potato patch. I could not stand *that*. So, taking a branch in each hand, I hurried them up, at the same time fending them off from the potatoes. They submitted to be driven quite as readily as a flock of sheep, so that I still hope to save my garden."

"April 8. These locusts have taken possession of a young orchard of Peach and Almond, and of a lot of fine dwarfed Pear trees (of many varieties, and about eight feet in height, full of blossom) which were very promising. They *roost* on the trees at night; breakfast on the leaves and young fruit, before lunching and dining on the grass and buds. Yesterday I could not drive them, and to-day the ground is so wet, they won't be driven. And, worst of all, the bulk of them are to the southeast of my vegetable garden."

"April 11. Still keeping up the fight with the locusts. I fought with fire; drove them into the stream of water, and in every way in my power, helped them on their way or destroyed them. A large flock of blackbirds came to my assistance, and did great service. They are now nearly gone, and I hope will soon take flight.

"April 18. I have been consoled to-day with the assurance that there are more locusts in this valley (Glenblythe) than anywhere else in the county.

"April 23. Vast numbers of the locusts have gone off, leaving only those of tender age, but possessing wonderful appetites. Some of them got off by flight, but the bulk kept on, on foot, towards the northwest, followed and preyed upon by hundreds of Black Hawks, or rather Buzzards, I think the *Falco Harlani.*

"April 29. Still a few left, but no more than the poultry and I can manage.

"I saved about two-thirds of my garden; but by constant toil.

"None copulated before leaving, and of course no eggs were left to perpetuate the curse, and it may be many years before they again visit this now sufficiently oppressed country.

Letter from Mr. S. T. Kelsey, Hutchinson, Kans., Forester to the Atchison, Topeka and Santa Fe R. R. Co.; written August 5, 1874.

The migratory grasshoppers (*Caloptenus spretus*) have again appeared in Kansas, and I hereby send you a report of their operations as I had promised. I first saw them at Hutchinson, on the Atchison, Topeka and Santa Fe Railroad, where they appeared on Sunday, July 26, at about 6 o'clock P. M. They were so thick in the air that they appeared like a heavy snow storm; those high in the air forming apparently light fleecy clouds, while those dropping to the earth resembled flakes of falling snow. Next morning, Monday, the 27th, at daylight, the country was literally covered with grasshoppers. Soon after sunrise, they collected on the growing crops, young trees, etc., and commenced eating, and before night had eaten the leaves from almost every green thing. All that I know of their leaving unhurt is sorghum, castor beans and honey locust trees. They did but little harm in most places to the cottonwood, box elder, Osage orange, elm, black walnut and oak, and such prairie weeds and grasses as were a little dried. They have worked some upon every tree that I have, except the honey locust. In some places, they have eaten the leaves, bark, and even the wood of the one and two year growths. On Tuesday morning, the 28th, I went west on the Atchison, Topeka and Santa Fe Railroad, and found that the grasshoppers reached the Arkansas Valley, as far west as Larned, on Sunday evening; on Monday, they appeared as far west as Pierceville; on Tuesday, as far as Aubrey; and on Wednesday, at 2 P. M., they appeared in force at Granada, Col., the terminus of the Atchison, Topeka and Santa Fe Railroad. I am told by persons who have come down the Kansas Pacific Railway that they extend on that line from Junction City, Kans., to Denver, Col.—a distance in direct line of about 450 miles. I have not been able to learn whether they extend west of Denver. They seem to be moving a little west of south—the first of the column occupying, as near as I can learn, nearly a straight line, at about right angles with the direction they are moving. The wind appears to change their course a little, but, I think, not very much.

They strip the country as they go, except the old, tough grasses and some things I noticed before, and then rise and fly—probably to the front of the column. I am not able yet to ascertain certainly how wide the column is, but it must be 200 to 300 miles in width. They are doubtless the same that have been destroying the crops of Western Iowa and Minnesota, and from the notes that I get from the north, I expect they have, in their course, destroyed all the growing crops of Central and Western Nebraska, as well as Kansas. They have not commenced to copulate yet, and will likely pass down into Texas or New Mexico to deposit their eggs.

I was told yesterday, by parties just from the north, that another column was moving down farther east, and taking a more easterly course, and would, if they kept on, strike through Eastern Kansas; however, I do not believe the story. Will post you if they do come. I learn from reports, and from parties who have traveled in British America, that they breed far up into that country, and as far south as Mexico. Thus it appears that nearly one-half of all the territory of the United States, excepting Alaska, is subject at intervals to the devastation of this migratory grasshopper, and it seems of great importance to the people of the West and the whole country that we should get all possible information respecting them, and the best means for destroying them or preventing their ravages. I am looking the matter up, and any further information that you may desire will be cheerfully given, so far as possible.

I am told that some fields of corn have been saved by building fires so that the smoke would pass over the field, and the grasshoppers would get up and leave on short notice.

Letter from Mr. E. Snyder, Nurseryman of large Experience at Highland, Kansas, written January 11, 1875.

The first appearance of the Rocky Mountain Locust, more commonly known here as Red-legged or Army Grasshopper, in this section of country, was about the 10th of September, 1866.

People who have lived here forty years, say this was the first time these grasshoppers made their appearance to their knowledge.

At our place they commenced coming down about 1 o'clock in the afternoon, at first only one at a time, here and there, looking a little like flakes of snow, but acting more like the advance skirmishers of an advancing army; soon they commenced coming thicker and faster, and they again were followed by vast columns, or bodies looking almost like clouds in the atmosphere. They came rattling and pattering on the houses and against the windows, falling in the fields, on the prairies and in the waters—everywhere and on everything.

By about 4 o'clock in the afternoon, every tree and bush, buildings, fences, fields, roads, and everything, except animated beings, was completely covered with grasshoppers. When they first alighted, they seemed exhausted, but it did not require much time for them to recover and become familiar with their new surroundings; they almost immediately commenced devouring and destroying plants with a voraciousness and rapidity truly astonishing to one not acquainted with them.

After about 4 o'clock few could be seen flying, except when disturbed, or making short trips probably in quest of food. They seemed to be inclined towards dry, warm places for the night, and all such places were packed and crowded by the time the sun went down.

They commenced depositing eggs almost as soon as they arrived, and the earth in many places presented the appearance of honey-comb, being caused by the boring or perforating process of these insects, preparatory to the depositing of the eggs. In this they showed a decided preference for hard, warm, dry places, such as roads, new breaking of prairie sod, etc., often selecting places so hard that it was difficult to penetrate the ground with a spade or sharp pointed stick; shady, moist places were partially avoided, although almost every spot of ground secured some.

The grasshoppers remained, and continued depositing eggs until after hard frosts, but became less abundant, and of less vitality, as cool weather and frosty nights approached. There was considerable rain during the Fall, and the hopes and predictions were that the wet weather would destroy the vitality of the eggs, and many thought their coming a mere accident, the first time they were ever here, and they would not trouble us any more

As cold weather came on, they collected more toward warm spots; wagon roads and railroad tracks, being warmed up during the day by the heat of the sun, were completely covered, and as they seldom move at night, the morning after found them stiff and numb, especially on the iron rails, from which they could not move until the sun warmed them up again, and railroad trains often had difficulty in getting up the grades on account of the wheels and track getting slippery, which gave rise to the story that "grasshoppers were so thick they stopped the cars."

Whatever our calculations may be, nature works according to laws we cannot change, and accordingly the following Spring we had a practical demonstration whether the eggs deposited the previous Fall would hatch or not. Although the Fall had been quite wet, with considerable rain in the Spring, and freezing and thawing in the interval, the eggs seemed to be proof against any kind of weather, and myriads of young grasshoppers hatched out as soon as the weather was warm enough. About the latter part of April and first of May appeared to bring forth the great bulk of them. They were apparently harmless little mites at first, but as they grew older and larger their voraciousness increased, and when nearly grown their destructiveness was alarming, and could only be understood by those beholding it. The young grasshoppers could not fly; but during the month of June, commencing about the first, they divested themselves completely of an outside skin, even unto the legs and feet, and came out a winged insect, and soon thereafter took their flight and left us.

In the month of September following (1867) they came down again, but not so many as the previous year. They again deposited eggs, but not in such vast quantities as before. A large proportion of the grasshoppers had attached to their wings or other portions small red insects, and also contained inside of them small white worms or maggots.

The Spring following (1868), the eggs again hatched out, but they were more under control of their various enemies, and the damage inflicted was not so much nor so general as the previous season, and they became infested with mites and worms before they flew away in June.

The next appearance of these pests was in August, 1874, and this invasion is still fresh in the memory of nearly every one familiar with the name of Kansas or Nebraska.

They have their preference for certain kinds of food, but in the absence of what they like best will eat almost anything. I have known them to eat the outside off of fence posts and boards, and other weather-beaten timber, until it looked as if the outside had been hacked or chipped off. I have had all the foliage and bark, and the ends of twigs, eaten off of young trees by them. Soon after coming down, they commence moving around, something like the foragers of an army, and soon gather and collect on such things as they like best in great numbers. Almost all the ordinary crops of the farm and garden seem to be desirable forage for them; but among the things that are most eagerly devoured are cabbage, onions, radishes, etc. I have frequently seen onion and radish beds with nothing left but the holes in the ground where they grew, having been eaten clean out. I have succeeded in raising tomato plants, but the ripe tomatoes are generally eaten. Apple and pear trees are stripped of foliage, and sometimes part of the bark; but the fruit is not often eaten, but left hanging on the trees. The foliage of peach, cherry and plum trees generally escapes, but the fruit, especially peaches, is generally destroyed, leaving the pits hanging on the trees. Willows and poplars soon become stripped of foliage—the tall Lombardy poplar sometimes looking like an immense swarm of bees, being almost covered with grasshoppers from the top to the ground.

While few vegetate things of value as food for people escaped without damage, there was a very noticeable difference in the amount of injury the same varieties of trees or plants sustained under different circumstances. For example: One tree or plant out of a number of others of the same kind might be entirely destroyed or devoured, while all the rest would be but slightly injured, or part of the same lot would be badly injured, and part but slightly. Upon examination it was always found that when this difference occurred, it was due to a decline in the vitality of such trees or plants as were mostly injured. It was quite noticeable that newly transplanted things were more subject to being fed upon than well established ones; that any tree in an orchard of the same variety that was injured by borers, excessive bearing, or from other causes, would be entirely stripped of foliage, while the others would not. And even in corn-fields, where plowing was done so as to injure the roots and cause the corn to wilt, they left the more vigorous growth and attacked the injured. I have observed a number of them get around the base of a growing corn-stalk an inch in diameter, and gnaw it off close to the ground, like a lot of beavers gnawing off a tree; and as soon as the corn fell to the ground, there was a rush for it by others that seemed to be in waiting, and the fallen stalk would disappear at an astonishing rate.

Of course they do not confine themselves to this kind of diet, and yet they seem to prefer it, as is shown in the eagerness by which they feed upon any vegetable growth that is wilted or on the decline. They show this disposition towards their own family, for whenever any of them get killed or disabled, others go to work and eat them up, the one being devoured by the others will kick and struggle as long as life remains, (and they have a wonderful tenacious life,) but it is all of no use, the length of life only depends on how long it will take the others to eat it up. Young plants just coming from the seeds, being weak and easily destroyed, are also particular objects of the tastes and appetites of these insects.

Having learned that their favorite places, or their resorts of choice, are hard, dry, warm places, and their preference in food such as is not strongest in vitality, the remedies most successfully employed against them here are early planting, good and thorough cultivation, and the production of thrifty and vigorous growth in crops.

In wet or cool weather they are comparatively harmless, being scarcely able to fly or eat; in clear weather the air is filled with them, (after they commence flying); in cloudy weather few can be seen flying, and on wet or rainy days they do not fly at all.

Their habits seem to be restless and migratory; they show this disposition as soon as they hatch out in the Spring, first collecting on patches of May-weed and smart-weed, and other things suited to their tastes and natures. They will move in bodies from one point to another in search of food to suit them. While young, and before they have wings to fly, they move in a peculiar manner, by walking a short distance and then jumping. In their travels they prefer hard ground, as it is somewhat difficult for them to travel (walk and jump) on loose ground. Thus it is that corn-fields of considerable size, when well cultivated, generally escape destruction, especially if the corn gets a good early start in growth. And I think there is no doubt but that a continuous and thorough working of ground by horse power, is a good safeguard against these insects from the time they hatch out until they fly. It may not be practical to save small tracts or lots of ground in this way, because they may encircle from all sides and overrun it.

I am one of those who believe there is a final remedy for every evil, and to know how to overcome them is simply a matter of time and study, and we may as well get right to work and prepare ourselves to meet and overcome, as well as we can, every calamity and misfortune that is likely to come in our way.

That the insect in question is one of the greatest scourges this splendid country is subject to, too many have the misfortune to know, and the past gives but little reason to hope we will not be troubled with them in the future, unless some organized practical method be adopted to destroy their power for harm.

INDEX.

PAGE

A

Acridium Americanum 173, 174
  " *perigrinum*.......................... 133
alabamæ, *Chrysobothis* var.................. 71
albivenosus, *Micropus* var................. 22
americana, *Clostera*........................ 27
American Oak Phylloxera..................... 118
Anisopteryx pometaria......................80, 83
  " *vernata* 80
anonyma, *Tachina*........................... 178
Anonymous Tachina-fly........................ 178
Anthocoris insidiosus........................ 41
Apple-tree borer—The Flat-headed............ 71
apterus, *Micropus* var...................... 22
arctata, *Hoplophora*........................ 106
Asparagus beetle............................. 5
asparagi, *Crioceris*......................... 5
Astoma gryllaria............................ 175
Astoma parasiticum.......................... 176
atlanis, *Caloptenus*........................ 169
atrox, *Œdipoda*............................. 124

B

basalis, *Micropus* var...................... 22
bivittatus, *Caloptenus*....................124, 173
bivittata, *Saperda*.......................... 27
Bracon charus............................... 75

C

calmariensis, *Galeruca*....................5, 86
Caloptenus Atlanis........................... 169
  " *bivittatus*........................124, 173
  " *differentialis*...........124, 171, 173, 180
  " *femur-rubrum*...............126, 128, 170
  " *Italicus*............................. 133
  " *spretus*............121, 128, 138, 170, 180
Canker-worms................................ 80
  Conclusion................................ 88
  Extract from the original Essay on the Canker-worm by W. D. Peck.............. 89
  Fall Canker-worm.......................... 83
  Practical considerations.................. 85
  Spring Canker-worm........................ 80
Capsus oblineatus........................... 27
carnaria, *Sarcophaga*....................... 180
carolina, *Œdipoda*.......................... 175
caryæcaulis, *Phylloxera*...............91, 97, 99, 117
caryæfolia " 117
caryæ-fallax " 118
caryæ-globuli " 117
caryæ-gummosa " 118
caryæ-ren " 118
caryæ-semen " 117
caryæ-septa " 118
caryævenæ " 117
castaneæ " 118
Cecidomyia destructor........................ 27
Cerasphorus cinctus.......................... 76
charus, *Bracon*.............................. 75
Chinch Bug................................... 19
  Appearance and Transformations of........ 20
  Appendix.................................. 51
  List of Correspondents who made Returns. 51
  Questions answered by Correspondents.... 52
  Bogus Chinch Bugs......................... 45
    The Ash-gray Leaf-bug.................. 47

Chinch Bug— PAGE
    The False Chinch Bug................... 46
    The Flea-like Negro-bug................ 48
    The Insidious Flower-bug............... 47
  Destructive powers of the Chinch Bug..... 24
  Direct remedies against the Chinch Bug.... 31
  Flight of the Chinch Bug.................. 29
  Heavy rains destructive to it............. 30
  Importance of Winter work and combined action.................................. 36
  Injurious to stock........................ 43
  Its food plants........................... 26
  Its injuries in 1874...................... 24
  Its injuries in Missouri in 1874.......... 25
  Its migration on Foot..................... 30
  Mode of reproduction and hibernation..... 27
  Natural enemies........................... 38
  Past history of the Chinch Bug............ 22
  Past history of the Chinch Bug in Missouri. 22
  Possible remedial and preventive measures that need further and thorough trial.... 41
  Preventive measures....................... 32
    Burning 32
    Mixing seed or protecting one plant by another................................. 34
    Invigorating the plant by manure, early sowing, etc 34
    Preventing the migration of the bugs from one field to another................... 35
    Rolling................................. 33
    Abstaining from the cultivation of the grains upon which the insect feeds..... 38
  Prognosticating 44
  Recapitulation............................ 49
  Unnecessary fears......................... 44
  Where the eggs are laid................... 28
Chrysobothris femorata....................... 71
  " var. *alabamæ* 71
  " " *fastidiosa*.................... 71
  " " *Lesueuri*...................... 71
  " " *misella*....................... 71
  " " *obscura*....................... 71
  " " *4-impressa*.................... 71
  " " *semisculpta*................... 71
  " " *soror*......................... 71
Chrysopa Illinoiensis......................39, 40
  " *plorabunda*......................... 40
  " *tabida*............................. 106
Chrysomela 10-lineata.......................16, 18
Cicada septemdecim........................... 27
  " *tredecim*........................... 27
cinctus, *Cerasphorus*....................... 76
  " *Harpactor*.......................... 41
cinerea, *Piesma*............................ 47
Clostera Americana........................... 27
Coccinella munda............................. 39
Colorado Potato-beetle....................... 1
  Alarm about it abroad..................... 3
  Injuries during the year.................. 2
  Is it poisonous?.......................... 6
  It passes the Winter in the beetle state..... 14
  It reaches the Atlantic................... 1
  New food-plants........................... 14
  New means of destruction.................. 15
  The beetle eats as well as the larva...... 14
  The proper scientific name of the beetle... 16
  The use of Paris Green.................... 8

Colorado Potato-beetle— PAGE
    Past experience 10
    Its influence on the plant 11
    Its influence on the soil 11
    Its influence on man 13
Common Flesh-fly 180
conica, Phylloxera 118
Coreus tristis 46
Corimelæna pulicaria 48
Crioceris asparagi 5
Cryptus grallator 75

D

Daktylosphæra caryæ-magnum 117
    “ *caryæ-semen* 117
    “ *caryæ-septum* 117
    “ *conicum* 118
    “ *coniferum* 118
    “ *depressum* 118
    “ *forcatum* 118
    “ *globosum* 117
    “ *hemisphericum* 117
    “ *subellipticum* 117
    “ *spinosum* 118
decemlineata, Doryphora 1, 16
depressa, Phylloxera 118
destructor, Cecidomyia 27
differentialis, Caloptenus 124, 173
dimidiatus, Micropus var 22
Doryphora 10-lineata 1, 16

E

Elm Leaf-beetle 5

F

Fall Canker-worm 83
fastidiosa, Chrysobothris var 71
femorata “ 71
femoratus, Micropus var 22
femur-rubrum, Caloptenus 126
Flat-headed Apple-tree Borer 71
    Its natural history 72
    Natural enemies 73
    Remedies 76
Flesh-fly—The common 180
forcata, Phylloxera 118
fulvivenosus, Micropus var 22
fuscipennis, Mesochorus 75

G

Galeruca calmariensis 5, 86
grallator, Cryptus 75
    “ *Labena* 75
Grape Phylloxera 90
    American grape-vines abroad 116
    American Oak Phylloxera 118
    Appendix 117
    Completion of its natural history 90
    Different forms presented by the species 93
    Direct remedies 105
    Grafting as a means of counteracting the work of Phylloxera 108
    Injury done during the year in America 99
    Injury done during the year in France 103
    Natural enemies 106
    Range of the insect in America 101
    Roots to use as stock 115
    Specific identity of the root-inhabiting and leaf-inhabiting types 94
    Specific diagnosis of Phylloxera Rileyi 119
    Spread of Phylloxera in Europe 104
    Susceptibility of different varieties 106
    Synopsis of the American species of the genus Phylloxera 117
    The sexual individuals 98
    Varieties of vines to graft and to use as stock 116
    Where do the winged females lay their eggs? 96
Gray's Improved Sprinkler 15
gryllaria, Astoma 175
Gryllus erythropus 126

H

Harpactor cinctus 41
Hippodamia maculata 39
holosericeum, Trombidium 175
Hoplophora arctata 106

PAGF

I

illinoiensis, Chrysopa 39, 40
immarginatus, Micropus var 22
insidiosus, Anthocoris 41
irritans, Leptus 177
italicus, Caloptenus 133

L

Labena grallator 75
Lachnosterna quercina 27
Leaf-beetle—The Elm 5
Leaf-crumpler—The Rascal 81
Leptus irritans 177
lesueuri, Chrysobothris var 71
leucopterus, Micropus 19
Locusta erythropus 126
Locust Mite—The 175
Locust—The Rocky Mountain 121
Lygæus leucopterus 21

M

maculata, Hippodamia 39
mantivora, Sarcophaga var 180
melanosus, Micropus var 22
Micropus leucopterus 19
    “ var. *albivenosus* 22
    “ “ *apterus* 22
    “ “ *basalis* 22
    “ “ *dimidiatus* 22
    “ “ *femoratus* 22
    “ “ *fulvivenosus* 22
    “ “ *immarginatus* 22
    “ “ *melanosus* 22
    “ “ *nigricornis* 22
    “ “ *rufipedis* 22
migratoria, Œdipoda 133
misella, Chrysobothris var 71
Mite—The Locust 175
Mite—The silky 175
munda, Coccinella 39

N

nigricornis, Micropus var 22

O

Oak Phylloxera—The American 118
oblineatus, Capsus 27
obscura, Chrysobothris var 71
Œdipoda atrox 124
    “ *Carolina* 175, 179
    “ *migratoria* 133

P

parasiticum, Astoma 176
Pemphigus vagabundus 97
    “ *vitifoliæ* 117
peregrinum, Acridium 133
Phalæna vernata 80
Phylloxera acanthochermes 119
    “ *Balbianii* 91, 97, 99, 119
    “ *caryæcaulis* 117
    “ *caryæfolia* 117
    “ *caryæ-fallax* 18
    “ *caryæ-globuli* 117
    “ *caryæ-gummosa* 118
    “ *caryæ-ren* 118
    “ *caryæ-semen* 117
    “ *caryæ-septa* 118
    “ *castaneæ* 118
    “ *coccinea* 119
    “ *conica* 118
    “ *corticalis* 119
    “ *depressa* 118
    “ *forcata* 118
    “ *Lichtensteinii* 119
    “ *quercus* 91, 119
    “ *Rileyi* 91, 117, 118
    “ *scutifera* 119
    “ *spinosa* 118
    “ *vastatrix* 91, 117
Pemphigus caryæcaulis 117
    “ *caryævenæ* 117
Perytymbia vitisana 117
Pieris rapæ 5
Piesma cinerea 47

PAGE
plorabunda, Chrysopa 40
Polygramma 10-*lineata* 16
pometaria, Anisopteryx 80, 83
Potato-beetle—The Colorado 1
pulicaria, Corimelæna 48

Q

4-impressa, Chrysobothris var 71
quercina, Lachnosterna 27
quercus, Phylloxera 91, 119

R

Rape butterfly 5
rapæ, Pieris 5
Rascal leaf-crumpler 81
Red-tailed Tachina-fly 179
Rhyparochromus devastator 22
Rileyi, Phylloxera 91, 117, 118
Rocky Mountain Locust 121
    Chronological history 132
    Descriptive 126
    Easily confounded with the Red-legged Locust 125
    Enemies and parasites 174
        The Anonymous Tachina-fly 178
        The Common Flesh-fly 180
        The Locust Mite 175
        The Silky Mite 175
    Food-plants 158
    Injury from other, non-migratory Locusts 171
    Its Flight and Ravages 156
    Its Natural History 121
    Its native Home: it cannot thrive in the Mississippi Valley, and can never reach far into Missouri 161
    Measurements of *C. femur-rubrum* 127
    " " *C. spretus* 130
    Ravages of migratory Locusts in the Atlantic States 167
    The Invasion of 1873 141
    The Invasion of 1874 143
        Missouri 144
        Kansas 148
        Nebraska 151
        Iowa 153
        Minnesota 153
        Colorado 154
        Dakota 155
        Manitoba 155

Rocky Mountain Locust— PAGE
    The migratory Instinct and great destructive Power belong to but one Species west of the Mississippi 124
    Time of Appearance 160
    What Injury may be expected in Missouri in 1875 166
    Where the Eggs are laid by Preference 123
rosæ, Selandria 27
rufipedis, Micropus var 22

S

Saperda bivittata 27
Sarcophaga carnaria 180
" var. *mantivora* 180
Selandria rosæ 27
scabrum, Trombidium 175
sericeum " 175
semisculpta. Chrysobothris var 71
soror " " 71
septemdecim, Cicada 27
Silky Mite—The 175
spinosc, Phylloxera 118
spretus, Caloptenus 121
Spring Canker-worm 80
Sprinkler for the Use of Paris Green Water 15
Synopsis of the American Species of the Genus Phylloxera 117

T

tabida, Chrysopa 106
Tachina-fly—The Anonymous 178
Tachina anonyma 178
Tachina-fly—The red-tailed 179
tinctorium, Trombidium 175
tredecim, Cicada 27
tristis, Coreus 46
Trombidium holosericeum 175
" *scabrum* 175
" *sericeum* 175
" *tinctorium* 175

V

vagabundus, Pemphigus 97
vastatrix, Phylloxera 91, 117
vernata, Anisopteryx 80
" *Phalæna* 80

X

Xerophylla caryæ-semen 117

ERRATA.

Page 5, line 16, for "State" read "state."
Page 7, line 7, for "calubrine" read "colubrine."
Page 17, last line, note, for "Dep. de l'Hèrault" read "Dép. de l'Hérault."
Page 21, line 14 from bottom, for "Lencopterus" read "Leucopterus."
Page 39, under Fig. 6, for "TTIM" read "TRIM."
Page 80, under the heading, add "(Ord., LEPIDOPTERA; Fam., PHALÆNIDÆ.)"
Page 90, under the heading, add "(Sub-ord., HOMOPTERA; Fam., APHIDÆ.)"
Page 94, in the sub-head, for "gall-inhabiting" read "root-inhabiting."
Page 124, line 10 from bottom, for "*Coloptenus*" read "*Caloptenus*."

3167 w

4